THE
ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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SOME ANXIETIES.

UNLESS the Enemy is already prepared to concede the entire armistice demands of the Allies, we may expect the diplomatic proceedings leading up to the signing of Peace to last over a considerable period. There are plenty of signs that those who, at the dictation of their War Lords, began the war when others were unprepared for it, are now eager to end it as quickly as possible. On the Allied side there is no disposition unduly to hurry the end lest the way be left open to another and even more terrible conflict at some later date. That the Allied peoples desire the end of a carnage into which they were forced quite against their inclinations is everywhere recognised, but it would be utter folly—and, indeed, a crime against future generations—if we were to sacrifice the whole cause of civilisation by any precipitate action which would give us an incomplete Peace. We believe it to be the determined resolution of the Allied peoples and of the Allied statesmen to exercise patience and avoid disaster.

It is, however, extremely important that while we continue to get on with the war we should have constantly before us in these days the certainty that such activities will not continue much longer. With the approach of the end, welcome as it is, we find ourselves at one of the most serious crises of the whole war period. No surprise need, therefore, be expressed at the anxiety which exists in some quarters concerning the position in which thousands of works and millions of workers, and millions of fighters, will find themselves when the last shot has been fired and the order to cease manufacturing has been issued. Manufacturing interests which have been almost entirely devoted to munitions production want to know something about the winding-up of their contracts, the awarding of compensation where conditions justify it, and what arrangements have been made to find employment for war workers in their factories. A question on these points has been asked in Parliament, and the reply is to the effect that the Government has long had such matters under consideration, but cannot at present make a statement about them. This hardly suggests that in the Government mind there can be any expectation of early cessation of large-scale munition manufacturing, though statements have appeared in several papers concerning large discharges of labour which have been already effected. It has long been understood that some shillings a week unemployment insurance will be paid, with, in approved cases, free railway passes back to their former homes. But it is the whole plan that we want to have published as soon as practicable and politic.

A week or two ago it was stated that the War Pledges Bill was soon to be before Parliament, but from replies in the Commons on Monday, it seems that the question of the redemption of pledges regarding restoration of trade-union conditions, though before the Cabinet, is not very far advanced, for Dr. Addison "has no doubt" that both employers and employed "will be consulted" about the matter. According to Mr. Rowntree the workers are getting into a "very doubtful condition" owing to the indecision of the Government on this matter. We are inclined to think that a frank and full statement by a strong Government, to the effect that experience has proved the impracticability of attempting to redeem these particular pledges, would be justified in the long run.

The present crisis is inevitable, but it is none the less serious because of its inevitability. It is the uncertainty of the situation that occasions anxiety, and we can only hope that the Government has very definite plans made which it will announce as soon as possible. It does not seem

too much to ask that controlled firms may be told, even now, what course it is proposed to adopt in case of such an eventuality as a speedy complete collapse of the enemy.

Very closely related to the possible cancellation of contracts and cessation of munitions production are the questions of economic policy and the new occupations for munition workers. The schemes for demobilisation of the fighting forces have been worked out very fully, and a good deal is known by the public as to the lines along which we shall proceed. The demobilisation of the workers in these islands is probably a question of even greater urgency and difficulty, yet the plans are not known, though probably they have been worked out. It may be that it is not desired to disturb the workers while still in the midst of very essential tasks by suggesting how great will be the difficulties of the coming days. But the controlled firms naturally want to know what sort of conditions they will have to face, so that they may make preparations. In regard to economic policy, that is still dependent upon inter-Allied arrangements; but we are promised a statement in Parliament at an early date. Furthermore, we are to have a General Election shortly, which probably will settle the broad principles to be followed by the nation and Empire during the next few years. For the good of the industrial life of the Empire the issue of the General Election is a matter of the first importance. It seems to us that if the political situation develops in such a way as to inspire confidence there will be less reason for anxiety as we face the financial problems of the future and try to modify the burden of excess profits taxation on new and vital industries, and to discreetly relinquish Government control of certain trades. The sooner we have in power a strong representative Government which will place in the foremost position the well-being of the entire nation during the critical early years of Peace, and will render secure the foundations upon which we may build a permanent home of prosperity and contentment for *all* our people, the sooner we shall remove some of the pressing anxieties which possess many serious minds just now. Our pious aspirations about industrial peace, educative as speeches may have been, will avail us little—the repetition of well-worn platitudes is becoming a trifle wearisome. A strong and wisely led Government, unmistakably representative of the voice and will of the people, and expressly put into office by a vastly increased electorate will do more to ensure Industrial Peace than many things that we may suggest. The seed that has been sown during the past few years concerning industrial relations will germinate and bear fruit more satisfactorily under such a *régime*, for of all the terrors from which we need to shrink, if we have the well-being of the nation at heart—Bolshevism, in whatever attractive garb it may bedeck itself, is the worst.

In regard to our schemes for demobilising the fighting forces we shall all have to approach this question with great patience, as well as with special foresight. The Minister of Reconstruction recognises that there are hundreds of thousands of men in the Forces who have not had the opportunity of earning big wages as multitudes of others have been able to do in the security of Home. It cannot be stated too often that it is because men have fought and run supreme risks abroad that others have been enabled to have a good time here. It is only the most elementary form of justice that under our scheme of demobilisation the Forces should return as early as possible to satisfactory employment. No doubt their just claims will be recognised by munition workers as readily as by anybody, but we have to negotiate some very difficult situations. Dr. Addison has promised that the demobilisation plans of the Government will be made public in detail very shortly—and they will be awaited with interest. In the main, the scheme is described as "demobilisation for industrial purposes"—that is, the release of men according to industrial requirements, whatever military unit they may happen to be in. The demobilisation of a whole battalion would be a comparatively easy matter, but a selective demobilisation according to qualifications requires extreme care and much labour. Long service, marriage, &c., will affect the course of action as well, but the industrial well-being of the nation must be carefully considered and provided for, and regard must be had to grades of industry and to the available raw material. No doubt many manufacturers, traders, and others, including masters of small businesses, will have been thinking a great deal about the place of the "pivotal" man in connection with their own coming works and business developments, and we expect that they already have in contemplation requests for the early return of particular managers, special staff men, &c., upon whom will depend the preparations for the return of the rank and file to industrial life.

We are all eager to "get a move on" with our practical measures for reconstruction and for the resumption of normal industrial operations, under whatever altered conditions experience has imposed. Let us hope that the Safe and Permanent Peace for which we all pray will come speedily, so that such may be possible.

The I.E.E.

On Thursday next, the London meetings of the Institution of Electrical Engineers will be resumed, and it will be noticed that the first item on the programme on this occasion is the Kelvin lecture, to be delivered by Mr. L. B. Atkinson; the list of papers given in our last issue covers a variety of subjects, and shows that the session will be full of interest from the technical point of view. But that is not the only important aspect of the Institution's present-day activities. A glance at the "Institution Notes" of the last two issues of the *Journal* indicates that the Council and its numerous Committees have in hand a very heavy and exacting catalogue of undertakings, some of which are of immense importance to the electrical industry; in particular, we would draw attention to the inquiry which is in progress with regard to the Board of Trade Reports on Electric Power Supply and Electrical Trade after the War; the proposed development of the Provincial Centres of the Institution; the formation of a "Commercial Electrical Development Committee"; the Conference on Overseas Engineering Trade; the Electrical Appointments Board; and the National Electrical Proving House. Most of these references speak for themselves; progress in each case will be watched with the keenest interest, and we hope that the new practice which has been adopted by the Council, somewhat gingerly perhaps, of keeping the members informed as to its doings will be continued and extended, for we believe that a large proportion of the dissatisfaction which has undoubtedly been felt by them in the past has been due to ignorance of the nature and extent of the Council's labours.

There is one item, however, of which the significance may not be readily appreciated. It was announced in the *Journal* for June that a Committee had been appointed to prepare a scheme for the formation of an Electrical Cooking and Heating Association; in July it was stated in an unobtrusive paragraph that as the result a new body entitled the "Commercial Electrical Development Committee" had been formed, which was "a separate organisation independent of any Institution or Association." We most cordially welcome the inauguration of this body, which, free from the trammels of tradition, will be able to fill the gap in our organisation to which we have so often drawn attention; it should take the place of the ill-fated Industrial Committee of the I.E.E., and of the similar Committee of the I.M.E.A., and do the work that is so ably carried on by the Society for Electrical Development and the N.E.L.A. in the United States, to the great advantage of all branches of the electrical industry.

But the items mentioned above by no means exhaust the programme outlined by the President in his inaugural address—a schedule of reforms which we should think beyond the power of any man to carry out in its entirety. We are certain that he will do his utmost to that end, for which purpose he accepted office for a second year, and, in particular, we hope that his dearest wish will be achieved—the acquisition of a Royal Charter for the Institution. That matter was forcibly referred to by Mr. H. I. Rogers, as chairman of the Western Centre, and we trust that other chairmen will follow his admirable lead, and that the members generally, for their own benefit and that of the electrical industry, will give the most cordial support to Mr. Wordingham in his heavy task.

ELECTRIC TRACTION ON THE CENTRAL ARGENTINE RAILWAY.

(*Continued from page* 389.)

The protective gear used for all high-pressure apparatus in the power station and on the system is of the Merz-Price type. Low-pressure panels with oil switches are equipped with overload trip coils and time limit fuses.

When the scheme was under consideration the split-conductor system of feeder protection had not been sufficiently tried out to justify its adoption in foreign work of such importance. Accordingly, the high-pressure transmission system consists of 20,000-volt underground feeders, with three simple cores, and of pilot cables for the protective devices. A system of telephone cables was also installed. Two high-pressure cables are laid through the streets from the power station to the nearest point of the electrified railway track. Then they run, one on each side of the line, to Olivos sub-station, the western one being looped into Victoria power and lighting sub-station. A third feeder is taken from the power station to Olivos along the track *viâ* Anchorena. Two feeders run from Olivos sub-station to Palermo sub-station, and two from Palermo sub-station to Retiro power and lighting sub-station.

The high-pressure cables are 0·1 sq. in. in section, and the pilot cables for the protective gear are 0·005 sq. in. in section, all being three-core paper-insulated, lead-covered, single-wire armoured; the telephone cables are eight-pair, dry-core, air-spaced, paper-insulated, lead-covered, single-wire armoured, and suitable for the use of superimposed circuits where necessary. Both below and on top of the armour all cables are served with specially-compounded waterproof preservative coverings.

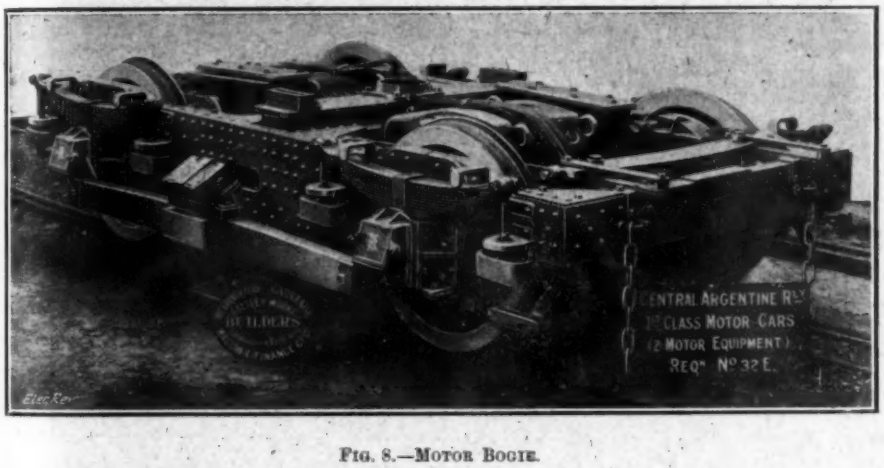

Fig. 8.—Motor Bogie.

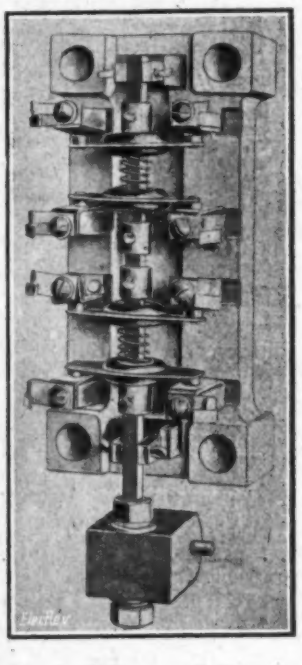

Fig. 9.—Contactor Interlocks.

In general the three types of cable are laid in the same trench at a distance of about 1 in. from each other. Above the high-pressure cable, and about 4 in. from it, is laid a creosoted plank, 8 in. by 2 in., to protect the cable in case of future excavations.

The feeder from the power station to Olivos *viâ* Anchorena is taken across the Canal San Fernando, which is navigable for barges and small boats, in a concrete tunnel laid in a trench in the bed of the canal.

All joints in the high-pressure cables were made in gun-metal sleeves, wiped to the lead of the cable, the sleeves themselves being surrounded by a creosoted wooden box with an iron cover. The sleeves were filled with compound, great care being taken to avoid producing cavities in the filling. Wherever the armouring is interrupted the joint is spanned by a copper bond of 0·05 sq. in. section.

After laying and jointing, the high-pressure cables were tested by applying for 15 minutes a pressure of 40,000 volts between any core and the lead and between any two cores.

The direct-current feeders from the sub-stations to the track and the jumpers spanning gaps in the conductor rail are of 1 sq. in. section, paper-insulated, vulcanised-bitumen sheathed, taped and braided. They are laid solid in Key fibre conduit filled with Trinidad bitumen. The conduits are 4⅛ in. external diameter and about 5 ft. long, the joints between conduits being made by fibre sleeves. The cables are supported in the conduits by fibre bridges. A creosoted plank is laid over the conduits.

The telephone system installed in connection with the electrification works provides communication between the power station and the sub-stations, the carsheds, and the signal cabins in the electrified area. Twenty-two-wire exchanges of the Sterling automatic type are installed at Victoria and at the power station.

In Olivos sub-station a panel is installed carrying two centre-zero voltmeters connected to pilot wires running to the negative bus-bars of the three sub-stations. A permanent deflection of one of the pointers indicates to the sub-station attendant that there is a difference of potential between the bus-bars in two adjoining sub-stations, and that one sub-station is "motoring" the other. He can then instruct one of the sub-stations to raise or lower its voltage of supply till it is taking its proper share of the load and the transference of current ceases.

Two sub-stations are provided in the electrified section to give a supply for general purposes, one situated at the Retiro terminus and the other at the Victoria workshops. The Retiro sub-station contains a B.T.H., 400-kw., motor-generator, a British Westinghouse three-phase, 600-k.v.a. transformer, and a Chloride storage battery of 4,000-a.h. capacity at 240 volts, controlled by a Bertram-Thomas battery regulating switch. The Victoria sub-station is equipped with three single-phase transformers of 375-k.v.a. capacity, made by the British Electric Transformer Co., Ltd.

The lighting of wayside stations along the electrified track is taken from the third rail, the circuits being arranged to take four 200-volt lamps in series. Vulcanised bitumen-sheathed, paper-insulated cables of 0·1 sq. in. section are taken from the third rail and track rails respectively to a "casilla," a small brick chamber, in which the switches are housed.

As the passenger service on the lines to be electrified is frequent and suburban only, the rolling-stock equipment was naturally laid out on the multiple-unit system. The stock ordered was as follows:—55 motor coaches, each equipped with two motors; 12 motor coaches, each equipped with four motors; 50 trailer coaches.

The coaches equipped with four motors will be used for hauling trains made up of a motor coach at each end and between them six trailer coaches taken from the old steam stock.

The end vestibules of the coaches are arranged to serve either as entrance ways for passengers or as driving compartments for the motormen. They are 4 ft. wide, and contain the driver's brake valve, master controller, and hand-brake wheel. Duplicate doors are provided, so that when the vestibule is used for passengers the electrical gear is all closed off. In the motor coaches the vestibule also contains the panels carrying the switches for auxiliaries and sundry tools.

The service duty required the provision of a brake pump for each two-motor equipment, capable of exhausting

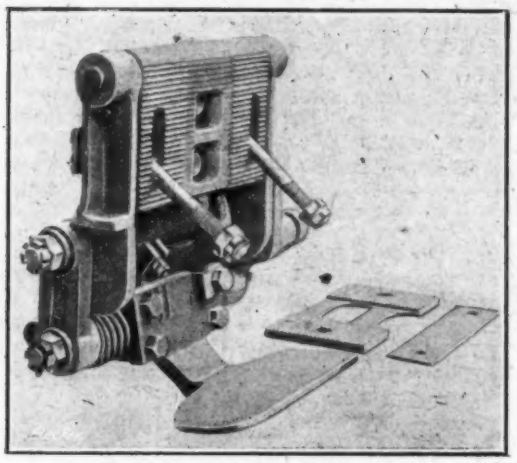

Fig. 10.—Collector Shoe.

50 cb. ft. of free air per minute; under working conditions of joint and valve leakage this equipment produces a 20-in. vacuum in the train system within 22 seconds after complete destruction.

A view of the motor bogie is given in fig. 8.

The collector gear consists of an under-running shoe (fig. 10), which makes contact with the under surface of a channel-shaped conductor rail. The shoe casting is carried on an oak beam fixed to lugs on the axle boxes. The collecting skate has two motions:—

(*a*) An up-and-down movement to follow the level of the conductor rail; this is controlled by helical springs on a

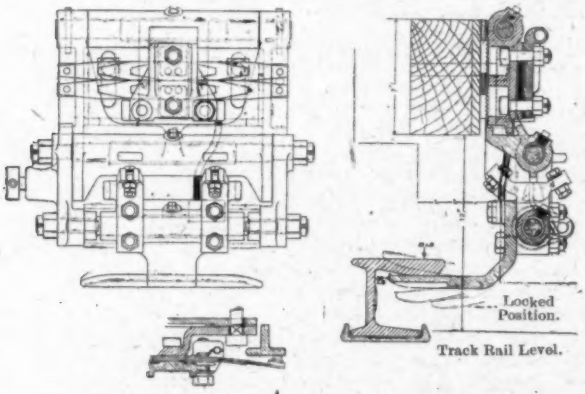

Fig. 11.—General Arrangement of Collector Shoe.

horizontal axle passing through the block to which the skate is bolted.

(*b*) A sideways movement to allow for the end play of the axle boxes and want of alignment of the rail; this is controlled by leaf springs bearing on the suspension links of the skate.

The difference in the heights of the top of the skate in its extreme positions is 2½ in.; its horizontal movement is 3 in. The average upward pressure of the skate is 28 lb. The shoe body and suspension links, fig. 11, are of cast steel, machined to gauge; the skate is of cast iron, and is designed to break when it strikes an obstacle. If desired, the skate can be locked down in such a position that it clears the conductor rail altogether, thus enabling the equipment of a coach to be isolated. Skates run about 130,000 miles before becoming worn out.

The following are some of the details of the motor-coaches and bogies:—

Length over buffers	65 ft. 3 in.
„ „ body	63 „ 3 „
External width of body	10 „ 3½ „
Height from rail to top of roof	13 „ 2¾ „
„ „ „ to floor	4 „ 2½ „
Distance between centres of bogies	40 „
No. of first-class passengers seated	72
Wheelbase of bogie	9 „
Diameter of wheels	3 „ 6 „
„ „ axle at centre	7 in.
Distance between centres of journals ...	7 ft. 6 „

	Two motor coaches.	Four motor coaches.	Trailer.
Weight of coach body, underframe and bogies	39·0 tons	40·5 tons	33·2 tons
Electrical equipment	11·5 „	20·5 „	1·3 „
Total weight	50·5 „	61·0 „	34·5 „
Weight per passenger seat ...	0·74 „	0·84 „	0·48 „

The average distance between stations on the Tigre (Victoria) route is 1⅓ miles; the present timing of electric trains which stop at all intermediate stations is 47 minutes, giving a scheduled speed of 22½ miles per hour. This can be increased to 25 miles per hour when desired, without overloading the equipment. As the average length of run is comparatively great, and as there are no severe gradients on the line, it was not necessary to utilise the whole of the weight of the motor coaches for adhesion by gearing a motor to each axle. Consequently, a two-motor equipment was adopted, each motor dealing with a load of about 45 tons.

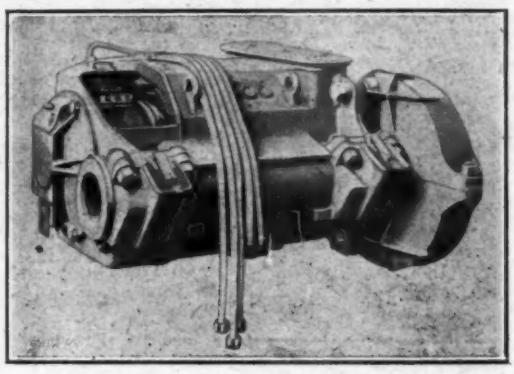

Fig. 12.—250-h.p. Motor.

With the width between wheels available on the broad gauge (5 ft. 6 in.), it was possible to design a motor (fig. 12) of ample capacity without interfering with the normal proportions of its various parts. In addition to the stopping service, the trains are also required to make express or semi-express runs, stopping only at one or two intermediate stations, and performing the journey at a scheduled speed of 37½ miles per hour. This condition is provided for by reducing the excitation of the main fields by 50 per cent. in one step. The motor, known as "G.E. 235," is rated at 250 h.p. (one-hour rating, 75° C. rise) at 800 volts; it measures 5 ft. ¾ in. overall, and the armature is 20 in. in diameter, with a core length of 17½ in. The weight of the motor, including gears and gear case, is 8,430 lb.; armature bearing (commutator end), 4½ in. × 8¾ in. The pinion has 22 teeth and the gear wheel 70.

The two motors mounted on each motor bogie are arranged for nose suspension from the bogie transom. The motor carcass is a single steel casting, with machined seats for the four main and four commutating poles. Provision for ventilation is made in the form of a rectangular opening of 160 sq. in. at the pinion end, arranged to take a flexible duct communicating with the interior of the coach, through which the air can be drawn if it is found that there is too much dust in the air taken direct from beneath the coach.

The motors are built and insulated for a working pressure of 800 volts, and the control system provides for operating with two motors in series—in parallel with full field and in parallel with tapped field. The control at starting is automatic, the rate of cutting out series resistance being determined by a "notching" relay, which allows the contactors to close in the proper order as the main current falls to a predetermined value. The main contactors (fig. 9) are wound to operate with any line voltage from 480 to 850. They are 15 in number, and are mounted in a sheet-steel box with the front covers hinged to swing open in case of heavy arcing. All cables beneath the coaches are carried in solid drawn steel conduit, screwed into the cases containing the apparatus; where breaks are required in the cable, junction boxes are provided. The conduit was erected in this country and shipped in position on the underframe, the cables being pulled in during the re-erection of the coaches at Buenos Ayres.

The leads which run from end to end of the train are three in number:—

(*a*) The train line, a single-core cable.

(*b*) The pump line, a twin-core cable, one core being the full-speed and the other the half-speed lead for the pump motor.

(*c*) The control line, a bundle of seven cables coupling up controllers, circuit-breakers, &c.

These leads bifurcate at the end of each coach and terminate in sockets attached to the headstock. Connection between coaches is made by removable jumpers and plugs.

The vacuum pump and motor are mounted in a framework slung to the underframe. The pump is a single-acting two-cylinder machine coupled to the motor through a helical spring coupling. It is geared down 4 : 1 by a chain inside the pump casing. The motor is of 3½-H.P. capacity, series wound. A series resistance which can be short-circuited permits it to be run at two speeds, one approximately double the other. Normally the motor is run at half-speed to maintain the vacuum against leaks and the use of the vacuum horn; when the driver's brake-handle is put into the "release" position the brake controller cuts out the resistance, and the motor runs at full speed till the required vacuum is obtained, whereupon the brake-handle is put to the "running" position, thus inserting the resistance again into the circuit.

The "dead man" device on the controller consists of a pilot valve operated by a knob on the main handle. When the knob is released, this valve admits air to the emergency valve, which is thus actuated, and opens the train pipe to atmosphere, blanking off the pump pipe.

For the reception of the electric rolling stock the company built a new car shed at Victoria, 230 yards long, and containing 10 tracks. Power for moving the coaches in the shed is supplied from overhead trolley wires carrying little carriages, from which hang cables that can be plugged into the train-line sockets on the coaches. An existing shed was adapted as a repair shop by raising the roof and installing 20-ton travelling cranes.

(To be concluded.)

"THE END OF THE WAR."

We have received the following communication from a lawyer, dealing with a question of considerable interest at the present time:—

In sending you a communication with the above title, I hasten to clear away certain impressions to which it may give rise. In the first place, I am not going to attempt to prophesy *when* the war will end. So many "experts" have proved their incompetence as prophets, that it is no time for an amateur to enter the lists. In the second place, it must not be said that, because I write under the above heading, I am of opinion that the war *is* at an end. Four-and-a-half years of Hun *camouflage* have not been without their lesson. I cherish no such belief. All the recent developments are part of the great peace offensive against which the country was warned long since.

But what I want to do is to say a few words about the legal meaning of the phrase, "the end of the war." It is by no means too early to pay attention to this matter. Numerous statutes, "emergency" and other, which have been placed on the book since August 4th, 1914, are timed to expire at the end of the war. All persons affected by these Acts of Parliament are, therefore, interested. Again, countless regulations have been made under, and by virtue of, these temporary enactments. If the statute goes, the regulation made in accordance with powers conferred by it must of necessity be affected.

Strange to say, although phrases like "the end of the war," and "during the present war," are constantly used, the period is never defined. One Act of importance to electric lighting companies (which came into force on August 8th, 1918), entitled the Statutory Undertakings (Temporary Increase of Charges Act), 1918, is to "have effect during the continuance of the present war and for a period of two years thereafter and no longer."

The Legislature has left the phrase undefined. Possibly it was thought that a certain nebulosity of duration would give added beauty to its emergency legislation. Some statutes have been described as the artistic creations of the Legislature, and did not Mr. Birrell, K.C., M.P., say on one occasion: "Nothing lends such beauty to a landscape painting as a bank of clouds in the background"?

For obvious reasons, the judges have not yet been asked to say what is meant by "the end of the war." But where Legislatures and judges have hesitated to tread, certain "mere lawyers," at the bidding of the Attorney-General, have rushed in. Having considered the matter in all its bearings, this Legal Committee, over which Mr. Justice Atkin presided, came to the following conclusion:—

> We assume that the war will be ended by a treaty or treaties of peace. In order to arrive at the final conclusion of the treaty, various stages will probably be required, such as agreements for armistice, cessation of hostilities thereunder, articles of peace, agreement of terms, signature of terms, ratification, exchange, or deposit of ratification.
>
> In our opinion, speaking of the legislation generally, the war cannot be said to end until peace is finally and irrevocably obtained; and that point of time cannot be earlier than the date when the treaty of peace is *finally binding* on the respective belligerent parties, and that is the date when ratifications are exchanged.

The italics are mine. It may be asked, When shall an agreement be regarded as finally binding on the Hun? The answer is that those who make treaties—the High Contracting Parties, as they are generally called—are not responsible for the *sanction* which is behind the agreement to which the plenipotentiary attaches his signature. When the Hun broke the treaty with Belgium, he treated it as not binding.

Having regard to the learned opinion set out above, it is obvious that "the end of the war," in the statutory sense, is as yet very far removed. It has taken four and-a-half years to get Europe into its present mess. How long must it take to draft final agreements which shall so deal with the multifarious problems created by the war, as to enable the treaty to be finally signed and exchanged!

But apart from the emergency and other statutes which are of temporary duration, one has to consider the Regulations made under these Acts, and, in particular, under the Defence of the Realm Act. As to these, the same Committee of lawyers say:—

> In our opinion, the true construction of the section [they were referring to a section in the Defence of the Realm Act] is that the Regulations so issued can operate only during the continuance of the war. The purpose expressed is for securing the public safety and the defence of the realm, which we think mean the public safety so far as threatened by our enemies in the present war and the defences of the realm against those enemies. The powers are given by reason of the national emergency, and vest the Executive with an authority so wide that we think it must have been intended only to exist during the existence of the emergency. The provisions for the trial and punishment of offences against the Regulations by Court Martial are not such as one would expect to remain in force after peace has been restored. This last consideration is obviously not affected by the provisions of the later Defence of the Realm (Amendment) Act, 1915 (5 Geo. V., c. 34). These considerations force us to the conclusion that Regulations issued under Section 1 (1) cannot have any valid operation after the termination of the war.

They then add this:—

> The provisions for the trial and punishment of offences against the Regulations also cease to have any effect after the termination of the war. It follows that after that date no offence against the

Regulations could be punished as such, though committed during war, and proceedings against such offenders, though instituted during the war, would automatically pass on its termination.

The general result, therefore, is that, so far as any Department of Government or executive officer is exercising any power given by a Defence of the Realm Regulation, such power will be lost on the day of the termination of the war. It follows that if such powers were exercised after that date the individual exercising them would be liable in a civil action for any infringement of rights, whether to person or property, that he might commit, whether wilfully or not.

It is difficult to exaggerate the far-reaching results of the above conclusion. It points clearly to the necessity for passing some special Act which shall enable some of these regulations to be continued.

There is one power in particular which must be provided for. I refer to the power to *take* possession of land—a power which has been very freely exercised during the war. There is no express power to "keep" possession, but the Committee are of opinion that the power to take implies a corresponding power to keep and use. As to property so taken which, in fact, exists in specie at the end of the war, there would be no legal right to detain it from the owner after the date of the termination of the war.

I have said enough to put forward the views of a number of lawyers on these difficult questions, and venture heartily to agree with them. In my opinion, persons concerned will be quite justified in shaping their various courses upon the basis that the law as above stated is the law of the land, and will remain so until varied by the Legislature.

ELECTRIC ARC WELDING.*

By A. M. CANDY.

Generators for welding service are usually compound wound, and should be provided with commutating poles because of the momentary overload produced when the arcs are struck. The capacity of the generating equipment required is determined by the character of the work to be performed and the number of operators who will work simultaneously. As a rule, welding service is of a very intermittent nature, but if the equipment is used for cutting work, such as risers on steel castings, the service may be practically continuous.

Switchboards and control apparatus for arc welding service have been materially improved within recent years. The successful application of arc welding has increased to such an extent in the industries that it has been found desirable and profitable to expand the one-man outfit into a system permitting a number of operators to work simultaneously at various positions distributed over an extensive area. This development has resulted from a more extensive use of the metallic electrode process, which has been generally adopted in railway and locomotive shops for many varieties of work.

The metallic electrode process generally is most satisfactory if the current required is within the limits of 50 to 175 amperes. Some applications, however, may require a minimum of 25 amperes, and still others a maximum of 225 amperes. For the carbon electrode service satisfactory results cannot be secured with less than 300 amperes. For some applications as much as 500 to 800 amperes may be required, especially if much cutting is to be done at an appreciable speed.

Because of the intense heat generated by the arc it is necessary to secure the electrode (carbon or metallic) in a properly designed holder. There is a distinct type of holder designed for each of the two types of electrodes. The carbon holder comprises an aluminium rod, one end being fitted with a suitable connection for attaching the feeding cable; to the other end a tube is welded, which contains two jaws or clamps for holding the electrode. The portions of the clamps in the tube are tapered, and the clamps grip the electrode when they are forced into the tube. The cable end of the holder is provided with an insulating, heat-resisting handle and a disk shield to protect the operator not only from electric shock, but also to protect his hand from the heat of the arc. The electrode is a solid carbon, or more strictly speaking a graphite rod, 1 in. in diameter, and from 6 to 8 in. long. This holder is sufficiently light to be handled easily, and is strong mechanically; the current-carrying parts have ample capacity for 500 amperes. For currents about 500 amperes, up to and including 800 amperes, a larger holder of similar design is available.

The metallic electrode holder is considerably lighter than the carbon holder, and the disk shield is omitted because the heat generated at the arc is much less intense. The electrode is clamped in the holder by a cam device, which is designed so as to accommodate electrodes of various sizes.

* From the *Journal* of the American Institute of Electrical Engineers, Vol. 38, No. 9. Abstract.

The intense brightness of the light rays radiated by the electric arc necessitates thorough protection of all parts of the human body. For this reason, if at all practicable, it is advisable to perform all welding within an enclosure, especially if other persons such as workmen are located within the vicinity of the welding equipment. Furthermore, it is essential that the head and hands of each operator and helper be effectively protected. Simply shielding the eyes with coloured glasses is not sufficient, because the rays emanating from the arc will produce a burning quite similar to, and equally as painful as, sun burn. The effect will not be noticed at the time of exposure, but will manifest itself within a period of 10 to 12 hours thereafter. For the protection of the body, ordinary clothing is usually sufficient, but the wrists and hands should be protected by heavy gauntlet gloves. Under no circumstances should the arms be exposed by rolling up sleeves. For the protection of the head and eyes, nothing is superior to a cylindrical helmet of micarta or aluminium normally held in place by leather straps, and suitably shaped at the lower end so as to rest easily on the shoulders. At the front of the helmet is an offset or recess, at the end of which is a frame containing glasses through which the operator observes the work when welding. This frame is held in position by springs, and is designed to be turned up, so that the glasses are out of range when the operator desires to inspect welding work performed, thus obviating the necessity of removing the hood so frequently. The glasses are mounted an appreciable distance from the operator's eyes to minimise the heat radiated from the glass to the eyes of the operator.

The glass window of the helmet is of primary importance, because it is absolutely essential to protect the eyes against the ultra-violet rays which are very abundant in an arc drawn between carbon and iron or iron and iron. Scientific investigations have revealed the fact that ultra-violet rays will penetrate human tissue to a depth of approximately one inch. Recent investigations have indicated that continued exposure of the eyes to the ultra-violet rays will lead to the formation of cataracts, resulting ultimately in total blindness. The helmet glasses must, therefore, successfully absorb these harmful rays. The best possible arrangement is that of three layers of glass. The outside layer (towards the arc) should be ordinary clear glass. The second and third layers should be of a greenish or amber tint, and must be capable of absorbing the ultra-violet rays, as will "Noviweld" glass, which has proved very satisfactory.

In many applications of the metallic electrode process the actual periods of welding are short, and, furthermore, the operator has one hand free. It has been found, therefore, that a shield is much more desirable than a hood or mask. Such a shield is similar to the mask; if a mask were flattened out into a sheet and a handle provided, it would be practically the same shape as a shield.

The principal materials used for arc welding comprise metallic electrodes, carbon electrodes, and filler material. The most satisfactory metal for general metallic electrode work probably is welding wire, which can be readily procured in rods of 3/32 to 1/4 in. in diameter, and about 14 in. long. Carbon electrodes are usually of special graphite material about 3/4 to 1 in. in diameter, and about 12 in. long. These electrodes are consumed slowly, but are subject to breakage, and therefore may require replacement frequently. Filler material may be classified the same as metallic electrodes as it serves the same purpose, namely, that of supplying the bond for the piece or pieces welded. As a rule no flux is necessary; however, authorities disagree on this point, and a flux is used by some operators. The theory of the functioning of the flux is that, if carbon is introduced into the weld from the carbon electrode, it will unite with the oxygen of the flux, thus leaving pure iron in the weld, the carbon having disappeared in a gaseous form, namely, that of carbon dioxide. In practice, it produces additional slag which must be removed from the weld.

Welding by the electric arc process is an art, and is not subject to any definitely fixed rules of execution. The degree of success attained will depend almost wholly upon the skill and intelligence of the operator.

One of the most important factors in producing good welds is the absolute freedom from dirt, grease, scale, &c., of the surfaces to be welded so as to produce good fusion and eliminate slag. A stiff wire brush is very useful for such purposes, although in many instances chipping must be done. A sand blast, if available, will be found very desirable, especially if much area has to be cleaned. Frequently it is permissible, or even advisable, to clean the work with the carbon electrode arc, no attempt being made to weld until the impurities have been burned off. If necessary, the article to be welded may be tipped, so that the molten impurities will flow off readily.

The next step is to properly shape the surfaces on which the weld is to be made. If a crack in a plate or a bar is to be filled in, it should be chipped so that a V-shaped 90 deg. groove is formed. In some instances it may be necessary to preheat the article before welding in order to prevent unequal cooling strains in the metal.

Practically no difficulty will be found in striking and maintaining an arc with the carbon electrode. With the metallic electrode, however, considerable difficulty may be experienced, especially at first, because the electrode will have a tendency to stick (freeze) to the work. Furthermore,

it is not possible to successfully maintain the arc much in excess of 3/16 in. long. As the electrode melts and forms the weld it is necessary for the operator to feed the electrode toward the work at practically the same speed as it melts in order to maintain the arc and prevent its rupture. The novice or beginner will do well to master the handling of the carbon electrode first.

When an arc is struck there is no arc voltage, and the contact voltage drop between the electrode and the work is comparatively small. The flow of current, therefore, is limited only by the resistance and reactance of the circuit including the welding or ballast resistance. A test curve indicated that when the metallic electrode was touched to the work the current increased from 0 to about 220 amperes in about 1/50 of a second, at which value it remained for about 1/20 of a second. The current then decreased to about 125 amperes in 1/20 of a second, after which the average value was somewhere near 140 amperes. Therefore, the entire period of time between striking the arc and obtaining the welding current was about 3/25 of a second. A similar curve illustrating the current and voltage fluctuations incident to striking an arc with a carbon electrode, indicated that the initial current was but little in excess of the normal welding current. This is no doubt due to the high contact resistance between the carbon electrode and the metal.

After striking the arc it should be played over the surface of the piece to be welded by a rotary motion of the hand, so as to heat a considerable surface uniformly. When the metal becomes molten, the flux (if any is used) and the filler material should be fed a little at a time. Sufficient filler should be melted and deposited at the proper location to form a satisfactory weld when the metal cools and solidifies. As the metal begins to cool it should, if possible, be hammered thoroughly to prevent sponginess and produce a finer grain in the finished weld. The metallic electrode is at once the heating electrode and filler material, therefore the arc must be played at the exact spot where the welding is to be done. Otherwise, the manipulation of the weld is the same as specified for the carbon electrode, except that a short 20-volt arc should be maintained.

It is essential that the electrode be of the proper polarity, namely, negative, for several reasons. First, for carbon electrode work, if the arc is maintained comparatively long, hard welds which are difficult to machine will not be formed. This is because the direction of the flow of current is from the work to the electrode, and therefore the possibility of injecting carbon from the electrode into the weld is minimised. Secondly, a greater proportion of the heat developed by the arc is generated at the positive terminal, and therefore is generated where it is most desirable, namely, at the surface of the metal to be welded.

If the weld to be executed is of considerable size and if strength is not of paramount importance, the carbon electrode process will produce satisfactory results in less time than is required for the metallic electrode. The carbon electrode is always used for cutting.

If the ultimate strength of the finished weld is an important factor the metallic electrode should be used. It should also be used if it is essential to have the heating of the work localised and restricted to a small area; furthermore, small welds can be better executed with the metallic electrode.

The field for the application of electric arc welding is a very broad one. Practically every industry making use of iron and steel can utilise the arc welding process to advantage.

(To be concluded.)

REPORT ON THE MEYER & CHARLTON MINE ACCIDENT.

The S.A. *Mining Journal and Engineering Record*, of Aug. 31, publishes an abstract of the report and findings of the Court of Inquiry into the accident at the Meyer & Charlton mine, in which 21 white men lost their lives. The report was issued on August 29th last by the S.A. Government mining engineer. The findings were: (1) That the men were killed owing to the man trolley cage, in which they were being lowered, breaking away and crashing to the bottom of the shaft; (2) That the breaking away of the man trolley cage was due to the snapping of the wire-rope sling by which it was attached below the skip; (3) That the sling snapped owing to an abnormal strain being put upon it through the sudden application of the electric hoist brakes following the automatic opening of a circuit breaker, which was set too lightly to meet the ordinary contingencies of working; (4) That the accident was not due to any act or omission of a criminal nature, or contravention of a statute or a statutory regulation. After setting out several more or less obvious recommendations, the report details the conditions at the shaft at the time of the accident, and in the course of the narrative of the accident it is stated that the sling between the trolley and the skip broke owing to the severe surging stress upon it caused by the combined action of the speed attained by the conveyances, the sudden stop of the hoist drum due to the brakes, and the spring of the long winding rope.

Experiments made after the accident showed that if the engine driver, when lowering unbalanced under regenerative control, moved his control lever slightly more rapidly or further than usual, the circuit breaker was thrown out by the excessive current generated, and it was considered that the circuit breaker acted at that time for the same cause as in the experiments. The driver was working under disabilities; his limit on the ammeter, according to his instructions, was the 1,000 ampere mark, which in subsequent experiments was found to coincide approximately with the current which opened the circuit breaker, the ammeter being incorrect; his speed indicator also was out of adjustment. At the time of the accident the driver may have misjudged the distance for stopping, his speed, or his load, and endeavoured to reduce too abruptly, but it appears clear that his hoist allowed no sufficient margin for the inevitable variations in human action, and that even if by manipulation of his lever he inadvertently caused the circuit breaker to open, he could not be held blamable.

The maker's peak load for the hoist was given as 1,300 amperes, and when it was first erected, seven years ago, the circuit breaker was set for 1,500. The mine electrician shortly afterwards raised the setting to 1,700 amperes. The driver was allowed to approach that amount though ostensibly limited to 1,000. Expert evidence was given at the inquiry that there should have been a large margin between the circuit breaker setting and the peak load, and therefore the responsibility for permitting the hoist to be worked practically without margin must be considered.

As, so far as known, the mine officials who made changes in the lowering procedure, which constituted no unusual winding practice, had no reason to imagine that the hoist was so delicately adjusted that such changes might be risky, they could not be blamed for failing to consult the engineering staff. According to his evidence the electrician knew prior to the accident what was being done. Unfortunately, he did not protest or take any special precautions. His error was considered excusable, and one which did not indicate neglect. Unless he thought deeply he would not realise that if the breaker did open when men were descending out of balance, an accident might occur, especially as it had several times opened harmlessly with upcoming loads. The position appears to be that all reasonable precautions were taken to deal with upcoming loads, which were those giving the greatest pull on the hoist, but that the peculiar conditions with down-going loads were not realised. Before the accident the circuit breaker never had opened while the load was descending, and evidently no one foresaw that it would do so and bring the automatic brakes into action, or realised that if the effect of regenerative control were suddenly cut off the time lag of two seconds would permit a down-going conveyance to acquire considerable velocity before the brakes acted. On the whole the brake adjustments were not condemned. Tests and inspection indicated that the sling was in good condition, and had an ample margin of safety under ordinary conditions.

In conclusion, it was stated that several errors of judgment for each of which no one was seriously blamable, contributed to the disaster, but that the most important, and one without which the accident would not have occurred, was in the circuit-breaker setting.

NATIONAL ELECTRICITY SUPPLY.

The Situation on Tyne-side.

At a meeting of the Newcastle-upon-Tyne City Council on October 23rd, a report of the Parliamentary Committee relative to the reports upon electric power supply of the Coal Conservation Sub-Committee, and of the Electric Power Supply Committee, was submitted. The report stated that the committee feared that, if the proposals of these reports received legislative sanction, the monopolies of the private electricity companies in this district would be maintained and consolidated, and that the publicly-owned undertakings which generated and supplied electricity in bulk in Newcastle-upon-Tyne and in other parts of the north-east area of England might pass from the ownership and control of the municipalities and be wholly dominated by a company or aggregation of companies conducted for private profit, enjoying (possibly with financial assistance from the Government) a monopoly of electrical enterprise in this area; while, at best, municipal electricity undertakers would be reduced to the position of distributors in their own areas of electricity supplied to them in bulk by the companies.

The committee was of opinion that it would be contrary to public policy that a public utility service of this character which was a monopoly should be under the control of private companies, the tendency during recent years having increasingly been to place such services under the management or direction of local representative bodies; and, in view of the circumstance that the Corporation had a right of acquisition within six months of July 3rd, 1922, of the electric lighting undertakings in the city of the Newcastle-upon-Tyne Electric Supply Co. and of the Newcastle and District Electric Lighting Co., and itself already generated and supplied electricity

for purposes of traction and power, the matter was regarded as one of extreme importance in the interests of the city.

The town clerk had prepared a statement which had been settled in consultation with representatives of other local authorities in the north-east area who were owners of electricity undertakings, and the principal grounds of objection to the proposals of the reports were formally enunciated therein. It was proposed that this statement, when approved by the other authorities, should at an early date be formally presented on behalf of the municipalities to the President of the Board of Trade and to the Minister of Reconstruction.

The Lord Mayor (Sir George Lunn) said the Parliamentary Committee had no objection to the creation of large electric power stations to supply wide areas with electricity, always provided that those power stations and those using them and governing them were not private bodies working only for private profit. Many municipalities might have, and some had, up-to-date plant for generating and distributing electrical energy; and if a huge trust of the kind were created, it meant that there would be no popular local control. The Municipalities that had generating stations should have representatives, and these representatives should be in a majority. Public interests should be supreme over private interests of any kind whatsoever. Therefore, a series of conferences of municipalities generating and distributing electricity in the north-eastern district had been held, with technical experts and legal advisers, and a reasoned statement had been drawn up, a copy of which had been sent to each member of the Council representing their views. He asked the Council to endorse this reasoned statement, as being their statement and that of the other municipalities; and they asked, also, that the Government should do nothing of the kind except after exhaustive inquiry, at which the municipalities might be represented to give evidence in the interests of the public at large.

The report was agreed to.

A B.T.H. BLAST-FURNACE BLOWER.

It is a matter of common knowledge that a *sine qua non* in the operation of blast furnaces is an absolutely assured supply of blast to the furnaces, since the failure of the air supply with the furnaces on blast would lead to most disastrous results, with very heavy pecuniary loss to the owners. A step in the right direction has been made by the British Thomson-Houston Co., Ltd., of Rugby, in a special form of blast furnace turbo-blower unit which it has recently completed, and which has satisfactorily passed the tests applied to it.

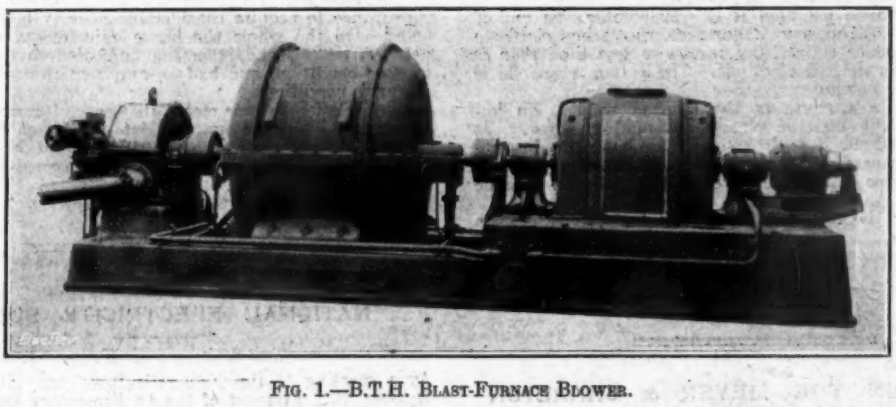

Fig. 1.—B.T.H. Blast-Furnace Blower.

The unit consists of a synchronous motor driving the blower, this motor being operated in addition as a power factor adjuster on a 3,000-volt, 50-cycle supply. Additional to the synchronous motor for driving the blower, a turbine of the Curtis type is provided in case of failure of current to the synchronous motor, or breakdown of the latter. The conditions laid down by the company to whose order this set was built were such that maintenance of a continuous supply of blast must be assured at all costs. These conditions, therefore, made necessary the provision of clutches between the synchronous motor and the blower, and between the turbine and the blower of some type that would be self-engaging and disengaging (whilst running), so that the turbine could be clutched to the blower shaft in order to drive the same in place of the motor. Moreover, it was specified that such a change over of the driving means should take place automatically in the absence of attendants from the engine room.

In view of the fact that the normal speed of operation of the set when driven by the synchronous motor is 3,000 r.p.m., and that the change over from synchronous motor drive to turbine drive must take place whilst running, it will be appreciated that the design of the clutches to meet these conditions required a considerable amount of attention. These conditions have been successfully met in the design of clutch which has been evolved and patented by the British Thomson-Houston Co. for the driving of this unit. These clutches can be well seen in the illustration (fig. 1) between the blower which is the centre member of the unit, the turbine on the left of the picture and the synchronous motor with its exciter on the right.

For the starting up of the turbine in the case of the failure of the motor, a special starting valve is provided on the turbine steam supply main, which consists of a balanced valve, the opening or closing of which is controlled by the delivery air pressure of the blower. In running up the set, the synchronous motor is started as a squirrel-cage induction motor, the clutch between the motor and blower engaging as soon as the motor rotor commences to revolve. When the motor approaches synchronous speed it is paralleled by closing the field switch of the motor rotor circuit, and then operates as a synchronous motor with all the attributes of a power factor adjuster.

The delivery air pressure of the blower holds the starting valve for the turbine, previously referred to, closed so that the turbine cannot run under normal conditions of operation.

If failure of the motor should occur at any time, the set commences to slow down in speed, with a consequent fall in air delivery pressure, and the starting valve on the turbine opens up, running the turbine up to speed; at the same time the clutch between the turbine and blower engages itself as soon as the turbine and blower shafts reach the same speed. This occurs with a small drop in air pressure. The blower is then driven by the turbine, and the synchronous motor rotor automatically disengages itself and comes to rest.

The change over from motor drive to turbine drive, owing to the type of friction clutch provided, takes place without shock; in fact, it is almost impossible to detect the moment of engagement, although the speeding up of the turbine is extremely rapid, as also is the deceleration of the blower shaft.

The blower of this unit is of the British Thomson-Houston Co.'s standard two-stage design of balanced impellers in which no balancing devices for end thrust are necessary. All the bearings of this unit are provided with forced lubrication, and in the case of the blower and turbine, the housings of the bearings are in addition water cooled.

This design of clutch should prove very useful in the future under conditions where it is essential to maintain continuity of supply of circulating water to the condensers of large turbo-generators, and where, in the case of motor-driven auxiliaries, failure of supply of current to the driving motor might cause a very serious temporary shut-down. In such a case, the circulating pump would be provided both with a motor and a turbine to drive the same, two of these patented clutches being provided, and the turbine being started up in the same manner as the blast furnace unit described, by means of a starting valve controlled by the delivery pressure of the water to the condenser.

There are numerous other fields of usefulness for this type of clutch which will present themselves to the minds of operating engineers.

Increasing Pressure by Means of Electrolysis.—It is a well-known fact that water is decomposed by an electric current, the rate of decomposition being 0·3354 gm. by one ampere of current in one hour. The products of that quantity of water are 0·416 litre of hydrogen and 0·208 litre of oxygen. If, when suitable arrangements for setting up hydraulic pressure have been made, a current be passed through the water, decomposition will take place, and the gases generated will produce pressure of any desired intensity. A writer in the *Chemiker Zeitung* tells of pressures so produced as high as 1,860 atmospheres.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Prepare for After-War Trade NOW!

You are no doubt aware of the fact that with the object of facilitating trade between the United Kingdom and the Netherlands, more particularly with a view to post-war connections between the two countries, a list is being compiled at the British Consulates of Dutch firms desirous of entering into business relations with British firms.

I may conclude from this that the British Board of Trade fully realises the importance of making connections now, and my grief is that practically all the British firms I have hitherto approached on this subject follow the "wait and see" policy, and put me off till after the war.

May I point out that to my mind (and your Consul here is of the same opinion) it will then be too late.

I think it would be well for you to point out in your periodical that this is the time to make preliminary arrangements, to gather information, and to feel one's ground.

There is plenty of work to be done before the rush begins, and the rush is sure to come. Other countries cannot, under present circumstances, supply much either, but they are not sitting still meanwhile.

N.V. Technische Handel Maatschappij.
J. Mulder.

Amsterdam, *October 12th*, 1918.

"Fraternity"—or Tyranny?

I think the publication by the E.T.U. of Mr. Wordingham's letter, presumably with the object of discrediting the E.P.E.A., will actually have the result of largely increasing the membership of the E.P.E.A.

I entirely agree with the advice given by Mr. Wordingham, and trust that all station engineers who are eligible will join the E.P.E.A. The doctors and lawyers have shown us what professional trade unions can accomplish, and I think we are a lot of fools if we do not follow their example.

Borough Electrical Engineer.

October 26th, 1918.

["Unity" is requested to send us his name and address. —Eds. Elec. Rev.]

Work Without Pay.

Under the Board of Trade coal economy scheme power-station engineers throughout the country have been appointed district engineers, for which, however, they are allowed no remuneration whatever, although the work takes up a considerable portion of their time, and involves the exercise of professional abilities of a high order.

This seems most unfair, as their brother officials who have been appointed coal overseers and road transport officers (both of which appointments could be filled by an intelligent clerk) receive considerable remuneration.

District Engineer.

October 26th, 1918.

The Electrical Power Engineers' Association.

I am desired by the Marylebone branch to ask your permission to be allowed to reply to Mr. Jones through the medium of the Review.

The branch was under the impression that the Power Engineers' trade union was merely a thing of mushroom growth; it thought, in fact, that it might have been organised by some members who had seceded from the A.E.S.E. However, the branch learns from a score of sources that it is one and the same organisation with a change of name only.

I am desired by the branch to ask Mr. Jones if his trade union is taking the necessary steps to join the Labour Party; also if it is instructing its members to give full recognition to shop stewards. The branch desires a reply through the Review, and not privately, as suggested by Mr. Jones.

John Vincent,
Secretary.
National Amalgamated Union of Enginemen, Firemen, &c.

London, N.W., *October 28th*, 1918.

Salt in Leclanché Cells.

With regard to your issue dated October 18th, page 377, *re* "Salt in Leclanché Cells," we beg to inform you that prior to the war we manufactured a special exciting compound which we registered under the name of "Salectron." This compound consisted of salammoniac, common salt, and other ingredients.

In view of the shortage of salammoniac and the still greater shortage of the other ingredients which we use, we investigated the possibilities of using a simple mixture of salammoniac and salt, and found that a proportion of 60 per cent. of the former and 40 per cent. of the latter gave very satisfactory results.

To make the position quite clear: when using salt and salammoniac as an excitant, there should be substituted six parts by weight of salammoniac and four parts by weight of common salt. It is immaterial whether the two crystals are mixed together at first, or whether they are dissolved separately, but the correct weight of salt to be added can only be known from the weight of the salammoniac crystal used.

The General Electric Co., Ltd.,
S. D. White,
Director.

London, E.C. 4, *October 24th*, 1918.

Technical Books for Men on Active Service.

May I ask the assistance of your valuable journal in an appeal to readers of the Electrical Review for any technical books on electrical or mechanical subjects that they can spare from their bookshelves? Classes in these subjects are being formed here with a view to giving the man now serving every possible chance to make himself thoroughly efficient for return to civil life; this will not only benefit the individual, but the nation also. I should like to add that the classes are being held after the day's work is completed; this fact alone points to a sincere desire of the men to attain real technical efficiency, and any books sent along will be greatly appreciated by them. I am sure your readers would be only too pleased to assist in the manner suggested.

H. Bligh Hill.

78th Labour Group,
Tanks C.W.S., B.E.F.
October 26th, 1918.

Empire Water-Power Development.

Whatever the object of the writer of the article under the above heading in the *Times* Engineering Supplement for October was, the fact is a complete condemnation of the capabilities of British engineers to at present deal with hydro-electric propositions.

Untold injury is done to the British engineering profession, and to the manufacturing industries of this country, by articles of the character mentioned.

The effect would be bad enough if the reading were confined within the shores of this country, but such articles are widely read in the British Overseas Dominions, the Indian Empire, and the Crown Colonies.

It is a stultification of British engineers, and an advertisement of the assumed capabilities of engineers of other nationalities without the slightest justification in fact.

Within the British engineering profession there are engineers capable of dealing satisfactorily with all the hydro-electric propositions ever likely to come forward, either in Great Britain, Ireland, the Overseas Dominions, or any other country.

If a *bona-fide* application is made to me to provide engineers capable of carrying out the five projects suggested by the writer of the article, I could at once name five British engineers each of whom would be thoroughly competent to satisfactorily carry out any hydro-electric proposition, whatever its dimensions might be.

A great deal is heard of the "Hidden Hand" working in the interests of Germany. British engineers would do well to discover and amputate the "hidden hand" which upon every conceivable occasion seizes the opportunity of discrediting their profession.

In my judgment the writer of the article displays lack of knowledge when he ignores the fact that the water powers of this country have largely remained undeveloped owing to (1) the strangulating effect of the Board of Trade and other regulations, and (2) the impracticability, until quite recently, of transmitting energy long distances due to the backward development of the high-tension side of the proposition.

My personal experience in carrying out hydro-electric schemes has not been exceeded by any engineer of other nationality. I enclose my card, and subscribe myself

British Engineer.

October 28th, 1918.

WAR ITEMS.

Post-War Priority.—Dr. Addison stated in reply to a Parliamentary question that the Government had, upon his advice, appointed a Standing Council upon Post-War Priority to consider all questions connected with priority and the allocation of materials and machinery where a shortage was to be anticipated. This council would consist of representatives of industry and commerce and of labour, together with representatives of certain Government Departments, and upon broad questions of policy would be under the direction of a Committee of Ministers presided over by General Smuts. Representative bodies of the industries concerned would be consulted by the council. It was hoped that the Standing Council would hold its first meeting at a very early date.

Feeding the Guns at Birmingham.—The Birmingham electrical undertakings warmly supported "Big Gun Week" by which about 8 million pounds was raised. The General Electric Co. invested £120,000 in War Bonds, and the employés £2,000; the Electric & Ordnance Accessories Co. paid £50,000 for war savings certificates for the Ward End, Aston, and Neamen Street Works' Associations, and the company itself subscribed £30,000. The Midland Electric Corporation for Power Distribution, Ltd., invested £5,000, and the War Savings Association of the Birmingham Electric Tramway Department £8,137.

Hours of Labour.—Lord Leverhulme, speaking at Manchester on Sunday, advised the utmost caution in connection with the readjustment of affairs after the war. Under our present lack of system with regard to hours of work, we could never have the education we should have. The sons and daughters of the workers, he held, must be as well educated as those of the employers. If we ran our machinery twelve hours per day, and men and women worked for six, then we could organise things better in the matter of education.—*Manchester Daily Dispatch.*

Economic Policy.—The annual meeting of the National Union of Manufacturers, the body which organised the monster deputation at the House of Commons last July to the Prime Minister and the Chancellor of the Exchequer on the Government's economic policy, has been fixed for November 19th. Considerable importance attaches to the proceedings, for by that date it is anticipated the country will have been placed in possession of the full promised statement of Ministerial policy. This announcement will be made in the Commons by the Prime Minister as soon as the international situation admits, and will include an intimation of policy regarding the Paris resolutions and other important post-war problems.—*Manchester Daily Dispatch.*

Industry and Drink After the War.—In pre-war days a good deal appeared in these pages concerning the bad effects of excessive drinking upon industrial operations. We need not cover the ground again just now, but it is unthinkable that in the days to come, when there will be a greater need than ever for all-round efficiency from men and masters alike, there can be a return to the former very unsatisfactory state of affairs. We shall all welcome freedom from unnecessary control, whatever form it may have taken, after the war, but we should profit by the experience of the war years and war measures in this connection as we are going to do in others. Lord D'Abernon, chairman of the Central Control Board, has suggested the following points for consideration in the formation of any permanent scheme of drink control:—

1. Curtailment of the hours of sale to the minimum consistent with reasonable requirements.
2. Avoidance of continuous opening periods of excessive length.
3. Diversion of consumption to meal hours.
4. Dilution of spirits and encouragement of the brewing of lighter beers.
5. Provision of canteens and other alternatives to the public house.
6. Abolition of compulsory drinking (*i.e.*, of "treating").
7. Maintenance of the price of alcohol at a proper level in relation to the prices of prime necessities.
8. Establishment of a Central Authority of Control to co-ordinate and supervise licensing.

Exemption Applications.—At Mansfield, six months were granted to W. Baguley (40), motorman on the tramways, and E. Harrison (49), electrician, was released from volunteer duty.

Somerset Appeal Court has refused a National Service appeal against exemption granted to G. H. Crawford (38, Grade 1), engineer in charge of the electric plant of the Tone Valley Manufacturing Co., Bridgwater, who was employed on Government contracts.

Amersham Tribunal has granted four months' exemption to E. C. Davis, electrician, of Beaconsfield.

At Ryde, H. F. Jolliffe (29, Grade 1), engaged with the Isle of Wight Electric Light Co., who is outside the age of reserved occupations by one year, has been given a further three months' exemption.

At Oxford, on October 21st, the Electric Tramway Co. appealed for D. Campbell (38, Grade 2), traffic superintendent, V. Hill (36, Grade 2), and T. Smalley (34, Grade 1), drivers. The last-named was stated to have been decertified, and could not be appealed for. The Tribunal recommended that his calling up should be suspended for a month, and the other cases were adjourned.

Before the Herts Appeal Court further exemption was claimed by T. H. Swansborough (46, Grade 2), manager and electrician, with Messrs Rogers & Gowlett, of Watford. As he is now in a certified occupation he was granted six months.

Sydney Consulting Engineers' Protest.—Consulting electrical engineers of Sydney have protested to Mr. Ball, Minister for Works, against the action of the Department in allowing the chief engineer to report on country electric lighting schemes. They claimed that the Department was doing work which might be left to private enterprise.

LEGAL.

London Electric Railway Arbitration.

Mr. H. F. Lofts, F.S.I., as arbitrator, has just given his decision in a claim against the London Electric Railway Co. for £3,210 as purchase money and compensation in respect of the compulsory acquisition of certain land in the district of the Broadway, Westminster, under Parliamentary powers. The claimants were Mr. H. C. Wheeler (the freeholder) and his mother, Mrs. Wheeler, who was tenant for life.

The Arbitrator has awarded £2,458.

The claim was based on a valuation of Mr. W. H. Mills, who was supported by Mr. H. M. Rogers.

On behalf of the Electric Railway Co., Mr. S. Walker, auctioneer and surveyor, valued the purchase money and compensation payable at £1,604, while Sir Alexander Stenning, surveyor and architect, of Cannon Street, E.C., submitted a valuation amounting to £1,692.

It appeared that Mr. H. C. Wheeler was carrying on a coal and wheelwright's business on the property, and a claim by him in respect of this trade had been agreed to at £500. By the request of the parties the Arbitrator added this amount to his award, and the total of the award was thus £2,958.

Cosmos Lamp Works, Ltd.

In the Chancery Division, on Friday last, before Mr. Justice Sargant, Mr. Jenkins, K.C., mentioned the case of Cosmos Lamp Works, Ltd., against Cosmore, Ltd., and said this was a motion to restrain the defendants from using their present name in connection with their business. The defendants had shown that they took the name *bonâ fide*, but they recognised that confusion might arise between theirs and the plaintiffs' name, and they were prepared to give an undertaking to take another name, with the consent of the Registrar. Counsel, therefore, asked his Lordship to make an order staying all further proceedings on that undertaking, and to make no order as to costs.

Mr. Ward Coleridge, K.C. (for the defendants): That is right.

His Lordship accordingly made an order staying all proceedings.

A Birmingham Appeal Case.

On October 18th, a Divisional Court of the King's Bench Division heard an appeal by Samuel Allsopp & Sons, Ltd., from a decision of the Birmingham County Court awarding the Birmingham Corporation £29 11s. 1d.

According to the *Birmingham Post*, Mr. Norman Birkett (for Messrs. Allsopp) stated that in March, 1917, the Birmingham Corporation gave his clients notice that an electric switch, which stood on the pavement at the corner of two roads in Birmingham, had been damaged by a lorry belonging to them. The four men on Messrs. Allsopp's lorry denied having touched the switch box, and so liability was repudiated. A summons was issued in the Birmingham Police Court, and the appellants were ordered to pay £5 and costs, the maximum allowed by the Gas Works Clauses Act. The Corporation then claimed a balance of £24 11s. 1d. in the County Court in respect of the damage done to the switch box, and recovered judgment for the full amount. The appellants now submitted that the County Court Judge was wrong in law, and asked that his judgment should be set aside.

Their Lordships allowed the appeal, with costs.

BUSINESS NOTES.

British Industries Fair, 1919.—For next year's Fair the Board of Trade has again secured from the Port of London Authority the great warehouses in Pennington Street. The Fair will open, as usual, on Monday, February 24th, and will remain open until Friday, March 7th. In order that preparations shall in no way interfere with the production of munitions, the exhibition will again be restricted to glass and pottery; paper, printing, and stationery; fancy goods and toys. The invitations to visitors will be issued by the Board of Trade, and admittance will be restricted to *bona fide* buyers interested in the above trades. Over 2,000 forms of application for space have already been issued to manufacturers in the trades concerned, and it is expected that the number of firms anxious to participate will be considerably in advance of last year, when orders to the value of over a million and a half were placed. Eligible manufacturers who have not received application forms should communicate at once with the Director, British Industries Fair, Board of Trade, 10, Basinghall Street, London, E.C. 2.

U.S. Foreign Trade Developments.—Forty-four manufacturers, whose domestic sales aggregate $100,000,000, have formed the Allied Industries Corporation to develop foreign trade. Agents representing this corporation will be sent to Cuba, Central and South America, Porto Rico, the Dominican Republic, the Philippines, and the Straits Settlements to introduce their goods. Combination was effected under the recently-enacted Webb-Pomerene Act.—*American Machinist.*

List.—Messrs. Johnson & Phillips, Ltd., Charlton, London, S.E. 7.—Leaflet No. T1/47 illustrating and briefly referring to their colliery transformers.

The Supply of Electrical Plant for Australia.—As briefly indicated in our last issue, a Conference of the managers or engineers of each of the authorities supplying electricity on any considerable scale in any of the six capital cities of the Commonwealth has been held at Melbourne, with regard to the importation of additional electric plant from overseas.

The Director of Munitions, in the course of a summary of the situation, said that a supply of electricity for the carrying on of certain industries, which might be designated essential industries, was obviously, if not a necessity, at any rate of very great importance to the Commonwealth and to the Empire. To allow of a supply of electricity to additional consumers, and to allow of a supply of electricity to existing consumers being maintained, additional plant was required, which plant could not, in practice, be imported from Europe or America without a recommendation from the Director of Munitions that the British or American Governments should issue a Priority Certificate for the manufacture and shipment of that plant.

Up to the time of the Conference, the Director of Munitions had received from each of the authorities supplying electricity on a large scale separate applications from time to time for Priority Certificates for separate items of plant required to enable the authorities to supply additional consumers of electricity and to maintain the supply of electricity to consumers already connected.

The Director of Munitions pointed out that the Ministry of Munitions in Great Britain and the corresponding department in America had recently shown signs of an inclination to refuse to issue Priority Certificates for any new plant required for Australia. The Director of Munitions was inclined to think that this was because, from time to time in the past, Priority Certificates had been refused for particular items of plant, and there was a tendency, once a Priority Certificate had been refused for a particular item of plant for Australia, to repeat the refusal for similar items of plant. The Director of Munitions also thought it was difficult for the Ministry of Munitions in Great Britain, for instance, to appreciate the fact that a large turbo-alternator was of no use to a supply authority without the boilers required to provide steam for the turbine, and that the boilers, again, were of little use without feed pumps, pipe work, coal conveyors, &c., such as were required to enable the boilers to be effectively used.

The Director of Munitions stated that, in any case, there was an increasing tendency on the part of the Munitions Departments in Great Britain and America to refuse Priority Certificates for the manufacture and shipment of plant for Australia. If this tendency to refuse to issue Priority Certificates was maintained, there was a possibility, if not a probability, of the electricity supply authorities in Australia finding themselves unable, not only to supply additional consumers of electricity, but even to maintain the supply of electricity to existing consumers. The Director of Munitions, therefore, suggested that requirements in the direction of additional plant and apparatus should be pooled, and that if this were done, and if he was assured that the list of requirements for the whole of the supply authorities was the minimum practicable, he would put forward their requirements, as a whole, to the Ministry of Munitions in Great Britain and the corresponding Department in America, with a recommendation that as they had reduced their requirements to what was absolutely necessary to maintain the supply of electricity and to provide for essential industries, Priority Certificates should be issued for the manufacture and shipment of all plant on the list. The Director of Munitions made it clear, however, that he could only pass forward the list of requirements with a recommendation for the issue of Priority Certificates if he were assured that—

1. The plant on the list would satisfy their requirements for two years.
2. The list contained only such spares as were absolutely necessary.
3. That in future, and until restrictions were removed, no additional lamps or motors would be connected by any of the supply authorities represented at the conference, unless the consumers applying for the additional lamps, motors, &c., required them for the carrying on of an essential industry or could be prevented from using electricity during the hours when the generating and transforming plant was most fully loaded.

It was pointed out to the Director of Munitions that the Acts of Parliament under which most of the electricity supply authorities worked, prevented the supply authority from discriminating between one applicant for a supply of electricity and another applicant, and that, therefore, under the law, as it stood, a supply authority, in the position to supply electricity to additional consumers, if it refused the supply to one consumer and gave the supply to another consumer, might lay itself open to an action of law, and might find itself liable for large sums of money. The Director of Munitions assured them that if the request was made, the Commonwealth Government would see to it that provision would be made, by the issue of a regulation under the War Precautions Act, for the protection of any electricity supply authority which, during the war, discriminated in giving supplies of electricity between an applicant for a supply of electricity proposing to use the electricity for an essential industry, and an applicant for a supply of electricity proposing to use it for another purpose than the carrying on of an essential industry.

The representatives of the electricity supply authorities in the six capital cities sat in conference after the Director of Munitions had left, and passed a number of resolutions, the object of which was to prepare such a list of requirements as was suggested by the Director of Munitions, and such assurances, with regard to the items on the list being the minimum requirements of the supply authorities, as the Director of Munitions asked for.

Metal Manufacturers' Difficulties.—At a meeting of the Walsall Chamber of Commerce it was stated that there was much dissatisfaction among manufacturers with the small proportion of metal that they were receiving from the Chamber's Allocation Committee compared with the extent of their requirements. It was felt that strong representations ought to be made to the Government Department concerned regarding the way in which Colonial customers were being treated at the present time. The trade was being driven to the United States.

Trade Announcements.—Messrs. British Electric Vehicles, Ltd., have removed from Hoghton Street to their new works, Churchtown, Southport. Their output of trucks will now be very considerably increased. We understand that when the new premises are fully fitted up they will be turning out at least ten trucks a week.

Messrs. Rose Bros. are opening a branch in Manchester (25-27, Miller Street) under the management of Mr. Harold R. Pearson, where a general stock of electrical goods and accessories will be carried.

Strike.—What is stated to be the first strike that has taken place at the B. I. & Helsby Cable Works, Prescot, since 1891, occurred last week, some 2,000 employés being affected. The men asked for a 47-hour week, instead of 53, and a 45-hour week for the night shift, without reduction of pay.

The Work of our Trade Commissioners.—It is announced in the *Board of Trade Journal* that, in consequence of representations made to the Department of Overseas Trade (Development and Intelligence), H.M. Trade Commissioners in the British Empire have been empowered to appoint an expert, or experts, to examine and report upon consignments of goods in respect of which a dispute has arisen when these goods have been imported from the United Kingdom, or any other part of the Empire that the Trade Commissioners represent. The Commissioners will only take such action when requested to do so by both parties to the dispute. Claims arising under insurance policies for goods damaged during the voyage do not come within the scope of the Commissioners' instructions.

British Honduras has been added to the sphere of H.M. Trade Commissioner in Trinidad (Mr. A. J. Pavitt), and he will visit the colony from time to time as opportunity offers.

Book Notices.—*The Employer* made its appearance in January last as a confidential circular issued by the National Employers' Federation. With the October number it appeals to a wider circle, at the price of sixpence. It is published at 2 and 3, Norfolk Street, Strand, W.C., and the number before us contains a good deal of matter that we think would be useful to employers at the present time. Its objects are to strengthen the relations between individual employers and their federation, and to present, ultimately, an agreed case to the public.

Modern Engineering Measuring Tools. By Ernest Pull. London: Crosby Lockwood & Son. Pp. viii + 115, figs. 110. Price 4s. 6d. net.—This small book serves to emphasise the change which has taken place in workshop practice during recent years, and which has been forcibly driven home by war conditions and the universal adoption of repetition methods in the manufacture of munitions of war. Jigs and gauges are the rule, but to arrive at these, accurate measurements are first necessary, and the author describes all kinds of shop measuring instruments, explaining very fully how to read micrometers and verniers with the aid of many examples, and dealing with a number of gauges for special purposes. He then treats of limit systems, giving tables of tolerances and allowances, and describing various forms of limit gauges. Finally, descriptions of the construction and use of accurate measuring machines are given, a number of tables of constants used in mensuration, decimal equivalents, &c., being appended. It is a timely and useful work, well printed and clearly illustrated.

"Handbook of Mechanical and Electrical Cost Data." By H. P. Gillette and R. T. Dana. Pp. xvii + 1,732; figs. 336. 1918. London: Hill Publishing Co. Price $6.00.

"I Fenomeni Elettro-Atomici Sotto l'Azione del Magnetismo." By Augusto Righi. Pp. xvi + 435; figs. 121. 1918. Bologna: Nicola Zanichelli. Price lire 17.50.

"*Journal* of the American Society of Mechanical Engineers." October, 1918. The Society: 29 West 39th Street, New York.

Liquidations.—United Vacuum Cleaner Co., Ltd.—Meeting, November 28th, at 17, Dacre Street, Westminster, to hear an account of the winding-up from the liquidator, Mr. F. G. Fuke.

Rotherham Electrical Engineering Co., Ltd.—First and final dividend 3s. 5½d. in the £, payable October 31st by Official Receiver, Figtree Lane, Sheffield.

Bankruptcy Proceedings.—Samuel Smith (trading as Smith & Sons), electrical engineer, &c., Victoria Square, Widnes, Lancaster.—An application was made on October 25th, at Liverpool, for the discharge from bankruptcy of the above-named debtor. The receiving order was made on March 10th, 1913, on the debtor's own petition. The debtor, it was stated, commenced business as a music and musical instrument dealer about 1890. The business appeared to have been carried on fairly successfully, and about two and-a-half years before the receiving order he, although without any experience, added to the business that of electrical engineer. He stated that two of his sons had some knowledge of the trade, and they superintended the businesses, the style of which had been changed to Smith & Sons. He attributed his position to "bad management of the business by sons, which he was unable to check."

His Honour Judge Thomas suspended the discharge for two years, the debit balance of £6 4s. 7d. to be paid before the order was drawn up.

Football.—The Sterling Lady Footballers (connected with the Dagenham Works of the Sterling Telephone and Electric Co.), who were undefeated last season, are again going very strongly. Against Handley Page, at Cricklewood, they registered their 50th goal of the season, and the 150th since their first game in September, 1917. This season they have scored 53 goals to nil, and in all 156 in 26 games against 10.

A football match took place on Saturday last at the Borough Polytechnic Ground, Herne Hill, between a team which irreverently denominated themselves "The Old Crocks of the G.E.C.," and the commercial apprentices of the same firm. The former team consisted exclusively of veterans who had been from 15 to 27 years in the service of the company. Their captain was Mr. E. A. Joyce, whilst the commercial apprentices were captained by Mr. G. W. Towers. The result, after a good fast game, every minute being played, was in favour of the former team by 6 goals to 4, whereat there was much rejoicing.

LIGHTING AND POWER NOTES.

Australia.—Victoria.—A deputation of the Melbourne E.S. Committee has waited on the Minister of Public Works to urge the Government to make an early decision regarding the supply of electricity for the future requirements of the State. It was stated that in a few years the present plant would be totally inadequate, and the Council would either have to obtain energy from the Government, or erect a new station itself, in which case it might find afterwards that the Government had adopted a scheme which would render the Council's undertaking unnecessary and unprofitable. It was desired that the Government should make a statement regarding the proposal to establish a central station in the brown coal area at Morwell, and the Minister stated that this would be brought before the next meeting of the Cabinet.

E.L. Schemes.—The Narracoorte (S.A.) Council is borrowing £5,000 for the installation of an electric lighting plant; the Flinders (Victoria) Shire Council is borrowing £3,600 for the same purpose, Messrs. Gardiner & Christie, of Melbourne, being the consulting engineers; a local company is being formed to install an E.L. scheme at Braidwood (N.S.W.).—*Tenders.*

Tasmania.—The Governor's speech, at the opening of the Tasmanian Parliament, stated that negotiations were proceeding for an early development of the King River hydro-electric scheme, in connection with the Mount Lyell Co. The scheme is estimated to cost £1,000,000, and will take three or four years to complete, and as the Government is not in a position to undertake the work, it is considered very probable that the grant to the Mount Lyell Co. will be ratified by Parliament.

Bingley.—Unsatisfactory Supply.—The U.D.C. has written to the Keighley Corporation complaining of the frequent failures in the supply of electricity.

Blackburn.—Proposed New Sub-Station.—The Corporation is considering the erection of a new sub-station, adjoining the technical school.

Bolton.—Wages.—The application of the E.P.E.A. that an increase of 20 per cent. of the present salary, plus £90 per annum, be granted to all technical engineers, has been referred by the Electricity Committee to the town clerk and the borough electrical engineer for report.

Bradford.—Wages.—The Committee on Production has awarded an advance of 3s. 6d. per week to the local textile trade electrical workers, making a total advance on pre-war wages of 28s. 6d. per week.

Continental.—Switzerland.—The following announcements on the control of electric power have been made in recent issues of the *Recueil des Lois Suisses*:—The Federal authorities have assumed control of the distribution of Swiss electrical power, and will take any measures which may be necessary to ensure a rational and economic use of Swiss water power. They will hasten the completion of hydro-electrical works under construction, or arrange for the building of new works for which concessions have been granted. The cost of these undertakings will be distributed among the users, who will ultimately benefit. If necessary, the authorities will instruct existing establishments to pool their supplies or to supply an additional undertaking or group of undertakings in the neighbourhood. Where there is a shortage of electrical power the authorities will prescribe the necessary economies. In practice the power stations will be authorised to order such economies as may seem fit, but the interests affected will have the right in all cases to appeal to the authorities against these private assessments. The authorities will settle all disputes arising between the various undertakings as to the use of energy, and certain enterprises will be expressly exempted from a reduction of their power. If necessary, the authorities may requisition at fixed prices any material, machines, or tools necessary for the production or transmission of electrical power.—*Board of Trade Journal.*

Sweden.—The Digersbergs Belysningstech Kraft Aktiebolag is the name of a new concern formed at Orsa to establish an electricity station.

Damascus.—We learn that one of the first acts of the Arab Administration was to restore the electric lighting system in the town. This was in working order by the evening of October 2nd, although the plant had been disused for weeks under the Turks. The tramway service, owing to incapable administration, was discontinued in 1917. This service was also resumed on October 5th.

Dewsbury.—Year's Working.—The past year's working of the electricity department resulted in the credit balance being increased from £1,226 to £1,309.

Dublin.—Wages.—The Arbitration Court dealing with wages claims of Dublin Corporation employés, has allowed the extension of the July award of 3s. 6d. per week to clerks, canvassers, meter readers, slot meter collectors, and others engaged under the Electricity Committee, and to the clerical staff of the Public Lighting Committee.

East Ham.—Year's Working.—The accounts of the Corporation electricity undertaking for the year ended March 31st last show that the total revenue amounted to £29,936, against £27,872 in the previous year, while the expenditure was £27,804, against £23,205. After meeting capital charges, the gross profit of £2,132 was converted into a loss of £2,203, against a loss of £244 in the previous year, and after adding the charges for the redemption of the debt, together with a deficiency of £3,606 brought forward, and deducting £4,250 transferred from the borough fund, the total deficiency was £7,784.

Glasgow.—Fire.—A fire which broke out in the control-box of an electric travelling crane at the Dalmarnock gasworks caused damage estimated at £350.

Glossop.—Street Lighting.—The T.C. has accepted the tender of the Urban Electric Supply Co. for lighting the electric lamps at the two fountains, and for the maintenance of street lamps in the North Road and Newshaw Lane districts.

Grimsby.—Proposed Extensions.—The E.L. Committee suggests that, as large extensions will probably have to be undertaken in the near future at the electricity works, the surplus on the working of the department be transferred to the reserve fund for that purpose.

High Wycombe.—Street Lighting.—The restricted public lighting is to be modified, and 40 additional electric lamps are to be lighted.

Iceland.—Hydro-electric Scheme.—As announced in this column on April 26th last, a hydro-electric development of considerable magnitude is planned by an Icelandic company, financed principally by Norwegian interests in Iceland. This scheme contemplates the development of over one million horse-power from the River Fjorsaavasdraget, in Iceland. The necessary river property has been acquired by the company, and surveys have been made on the basis of which it is proposed to build six power houses capable of producing 697,000 H.P. during low water and 1,114,000 H.P. during high water. The execution of the scheme seems to offer many difficulties owing to the great distance of the power house from the coast and the lack of railroads. Before the work can be started it will be necessary to build a railroad, the first in the island. Material for the farthest inland power station will have to be transported over a distance of 40 miles.

Lighting Regulations.—Lighting Allowances.—The Coal Controller has decided to reduce by another 25 per cent. the lighting allowances in hotels, restaurants, and large shops in London and the big provincial towns.

To-day is the last day for making applications for coal and light rationing forms in England and Wales. Later applicants will receive less consideration.

Minimum Charge.—At a meeting of the Controller with the representatives of electrical undertakings throughout the country it has been arranged that the "minimum charge"—the amount charged whatever is used—should extend over the year, and not be a fixed charge for each quarter. Where the quarterly minimum was 5s., and only 3s. worth was consumed, say, in the September quarter, that 2s. will be deducted from the account if in the succeeding quarter, say, 7s. worth is used. The yearly charge is not to exceed £1, and where the charge has been a smaller amount that will now be the maximum.

London.—Hammersmith.—Wages.—The B.C. has increased the war bonus of the employés at the electricity works from 18s. per week to 20s. per week. An application from the E.P.E.A. for an increase of 20 per cent., plus £90 per annum, to technical engineers on the staff of the electricity department, has been referred to the Council of Municipal Authorities Owning Electricity Undertakings, with the object of bringing the matter, if necessary, before the Committee on Production.

Meters.—Owing to the difficulty of having the prepayment meters recalibrated at the present time to measure the new rates in force, the Electricity Committee has recommended the B.C. to discontinue the use of the prepayment mechanism and to convert the meters into ordinary registering meters.

Mains Extensions.—In order to supply a further 300 H.P. to the works of the General Stores and Munitions Co., at Leysfield Road, the Electricity Committee has recommended the B.C. to extend the main to the works, at an estimated cost of £2,700, and to purchase three 111-microfarad condensers from the British Insulated and Helsby Cables, Ltd., at £625 each, such condensers to become the property of the General Stores and Munitions Co.

Kensington.—Fire.—A gas main of the Gas Light and Coke Co., at South Kensington, took fire through an escape on Tuesday, last week, resulting in a troublesome outbreak affecting several properties. About 180 ft. of electric cable of the Knightsbridge Electric Lighting Co., a street lamp, a distribution box, two telephone junction boxes, and 60 ft. of the pavement were damaged or destroyed.

Luton.—Year's Working.—The accounts of the electricity undertaking for the year ending March 31st last show that the gross profit was £16,511 and the net profit £2,203, a decrease of £2,822. The income increased by £8,188 and the working expenses by £8,792.

New Zealand.—Water Power.—The report of the Government electrical engineer on the Arapuni hydro-electric scheme states that it would be capable of producing 40,000 H.P. at an estimated cost of £1,200,000. As, owing to financial difficulties, only a small portion of this power could be developed during the next few years, the Auckland Provincial Industrial Association has recommended the Government to take over the Horahora hydro-electric works of the Waihi Gold Mining Co. This plant is capable of generating 9,000 H.P., and, under the terms of the concession, the Government can take over the complete plant at cost price, which was less than £200,000, and by the expenditure of a further £100,000 an additional 7,000 H.P. could be obtained.

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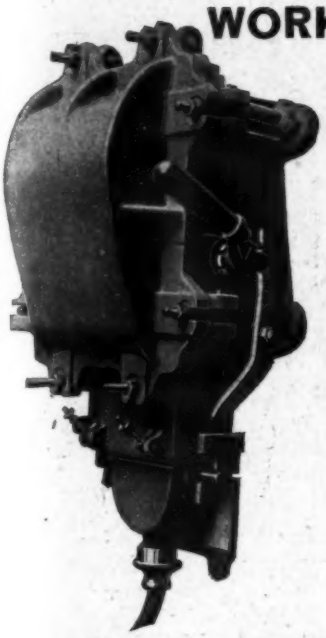

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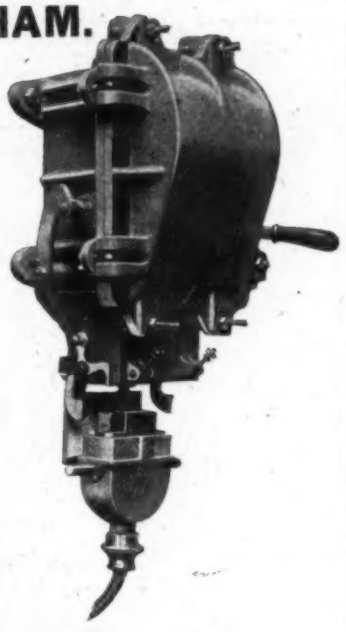

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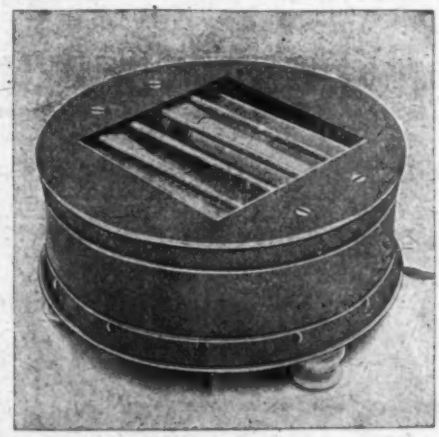

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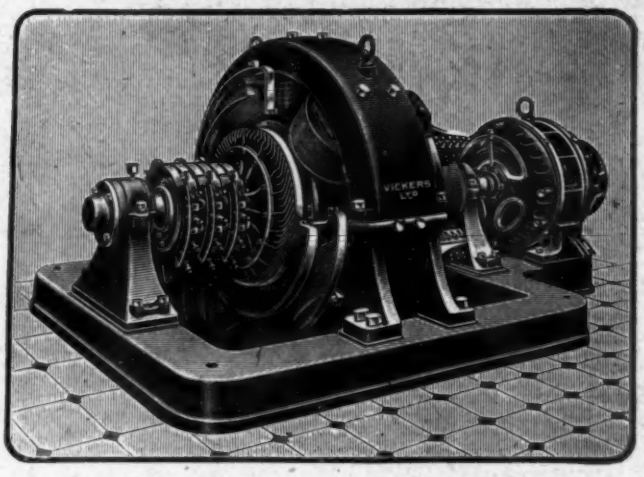

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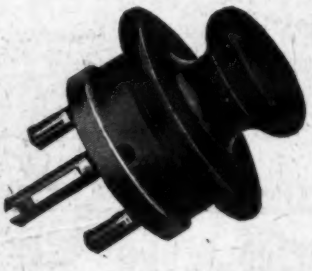

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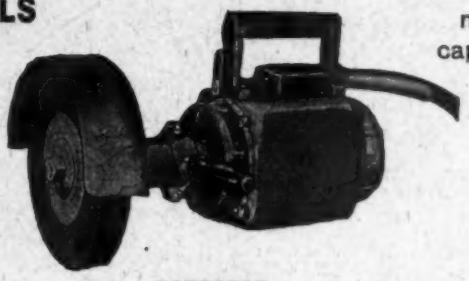

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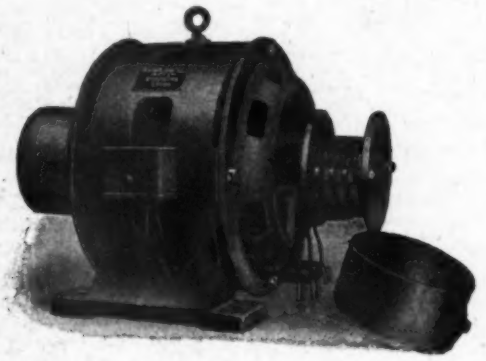

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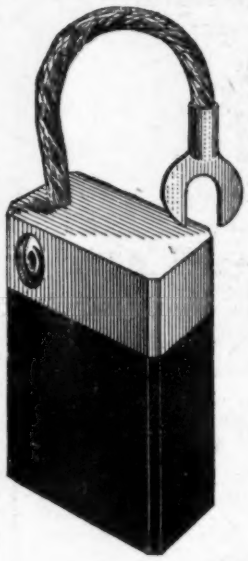

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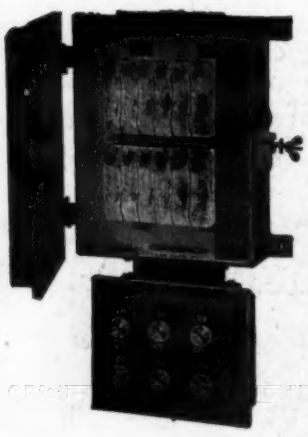

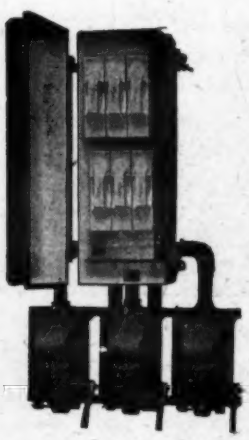

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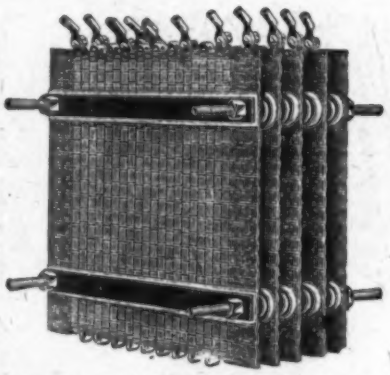

All Grids are sent out marked with the number of ohms resistance, and customers can readily arrange them in series or parallel to suit requirements.

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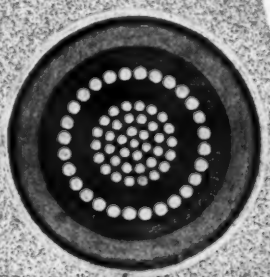

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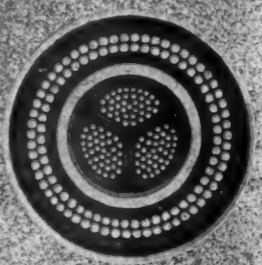

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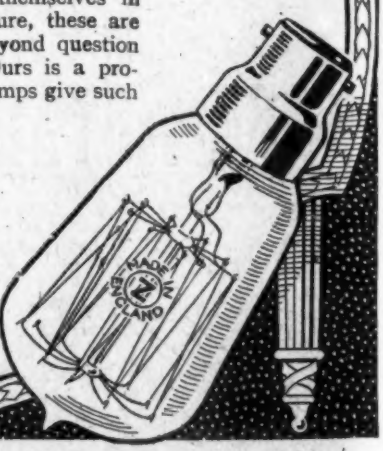

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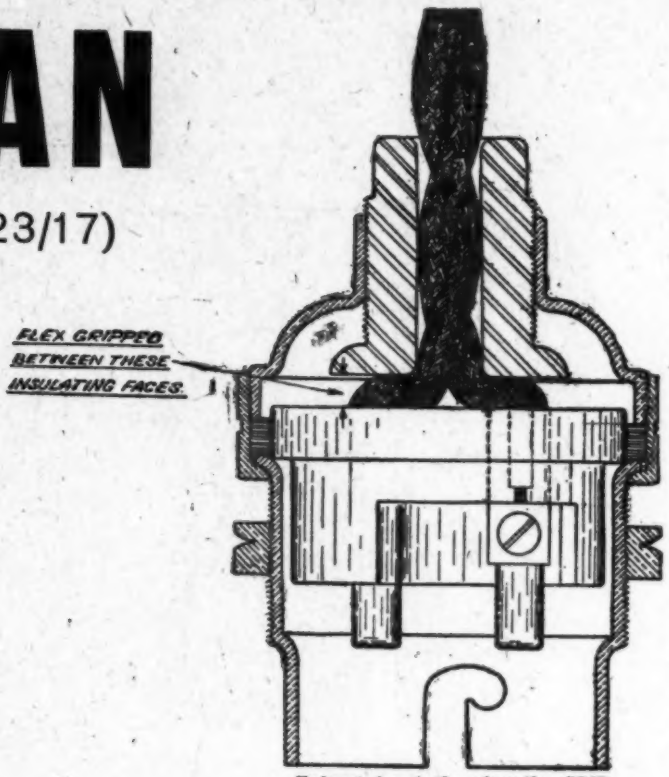
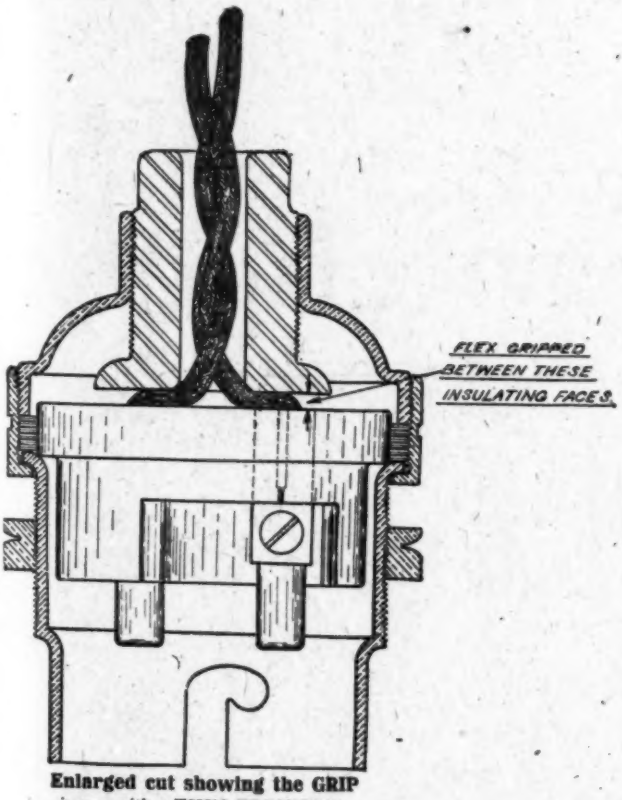


Enlarged cut showing the GRIP in use with a THICK FLEXIBLE.



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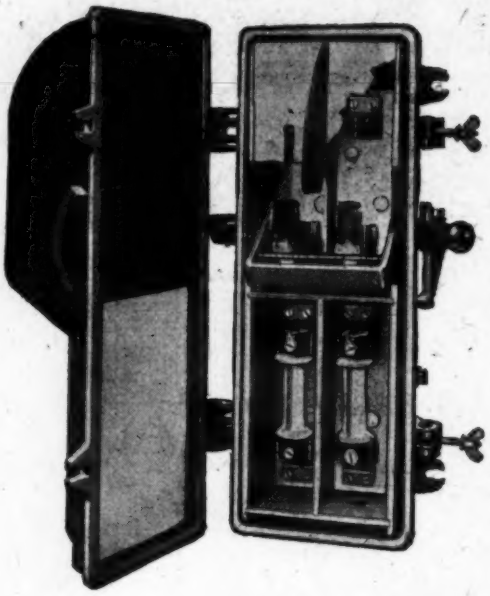

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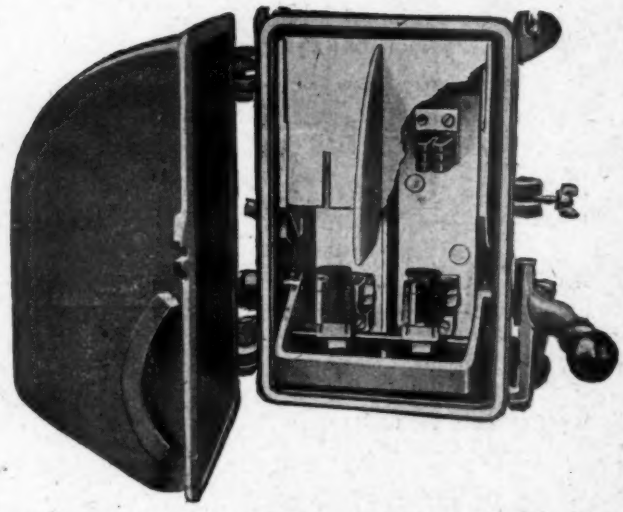

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Armament Buildings,
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London, S.W. 1. 3076

SENIOR ASSISTANT ELECTRICAL ENGINEERS.

SENIOR ASSISTANT ELECTRICAL ENGINEERS required for Power and Sub-station Work for North-East Coast; preference will be given to men who have been discharged from the Army or Navy.

Applicants must have had experience with 3-phase Generators and Rotary Converters.

Wage 74s., plus 12½ per cent., per week.

Fourteen days' holiday per annum will be granted with full pay.

Applications in writing, giving full particulars of theoretical and practical training, together with copies of references and date on which duties could be commenced, should be addressed to—

3060, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

SITUATIONS VACANT.—*Continued.*

DRAUGHTSMAN.

DRAUGHTSMAN required for the Battersea Borough Council's Electricity Department. Must have experience of making drawings of power and sub-station equipment, street mains, &c.

Apply by letter only, enclosing copies of not more than three recent testimonials, stating age, experience and qualifications, and salary required, to CHIEF ENGINEER, Electricity Department, Lombard Road, Battersea, S.W. 11. 3063

ELECTRICAL CONTRACTORS.

WORKING MANAGER required for the Manchester House of a firm of Electrical Contractors. Commencing salary £200 per annum, and good commission on profits. Applications treated in confidence, and should state fullest particulars and whether applicant could introduce post-war business. No person on Government work, or residing more than 10 miles away, will be engaged.—

5807, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

SWITCHBOARD ATTENDANT.

WANTED, a Switchboard Attendant at the Stretford Electricity Station. Wages (including bonus and 12½%) £2 7s. 10d. per week of 56 hours.

Applications, stating experience, accompanied by copies of not more than two recent testimonials, to be addressed to R. ROWLAND, Engineer, Electricity Works, Chester Road, Stretford. 3045

SHIFT ENGINEER AND SWITCHBOARD ATTENDANT.

SHIFT ENGINEER, experienced with A.C. and D.C. plant, and able to control men, wanted in Municipal Works, South of England, to take charge of 8-hours' shift. Salary 40s. × 20s. × 12½% for 56-hour week. Also Senior Switchboard Attendant, Salary 35s. × 20s. × 12½ %.

Apply, stating age, experience and testimonials, to—

3072, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

BOROUGH OF ST. HELENS.

APPLICATIONS are invited for the post of Chief Electrical Engineer, at a commencing salary of £650.

Applications, with full particulars as to age, qualifications, &c., to be sent to the TOWN CLERK, St. Helens, not later than FRIDAY, 8th NOVEMBER. 3008

SHIFT ENGINEER.

SHIFT ENGINEER wanted at Heston and Isleworth U.D.C. Electricity Works, Bridge Road, Hounslow; must be good mechanical engineer with 3-wire experience. Wages, including awards, £3 11s. per week. 3062

DRAUGHTSMEN WANTED.

DRAUGHTSMEN required at Portsmouth, for electrical work. State age, experience and salary.

Replies to Box 747, Willings, 125, Strand, London, W.C. 2. 3073

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A LARGE Manufacturing Company require immediately three Engineers, to be responsible during an 8-hour watch for the efficient operation and maintenance of their boiler houses. Only men with first-class experience with Babcock & Wilcox Boilers and Chain Grate Stokers need apply. Commencing salary £250 per annum.—3044, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARMATURE Winder. Wanted a good reliable all-round Armature Winder, with some experience of A.C. work. Permanency for good man. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply to LANG AND SQUIRE, LTD., Wales Farm Road, Acton, W. 3. 3009

ARMATURE Winders ; only highly-skilled men wanted. Highest rates paid. Comfortable working conditions. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply J. ORRICK, Messrs. Swarren, Ltd., 52/54, Theobald's Road, London, W.C. 1. 5920

ARMATURE Winders, used to repair shop, D.C. work. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply H. D. & S., 32, Newington Causeway, S.E. 1686

(*Continued on next page.*)

SITUATIONS VACANT.—*Continued.*

ASSISTANT in Accessories Department wanted. Some experience essential. Discharged or ineligible man. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply, giving particulars of age, experience and wage required, to SLOAN ELECTRICAL CO., LTD., 12, Golden Lane, E.C. 1. 5891

ASSISTANT, with good technical knowledge A.C. and D.C., for small electric motor works, to take charge testing, designing details, &c. Firm is engaged solely on Government orders.—Apply, letter or personally, WOODS, Hythe, Colchester. 5917

CAPABLE Overhead Linesman required for the Dover Corporation Tramways; must have had experience of the erection of new trolley wires. Preference given to one with knowledge of armature repairs.—State age, experience and wages required, to GENERAL MANAGER, Corporation Tramways, Town Hall, Dover. 3064

COMPETENT male or female to manage contracting business, residential district; show room, sales and office experience necessary. State age, experience and salary; S.W. London. No person resident more than 10 miles away, or already on Government work, will be engaged.—5747, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DESIGNER (telephone instruments and kindred apparatus) required by Controlled Establishment in London area. Must be experienced man with good practical knowledge, and capable of evolving and developing new designs, particularly interphones. No person already engaged on Government work need apply.—Apply, stating age, experience and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A6253. 5894

DESPATCH and Receiving Clerk required for electrical warehouse; one with experience in handling electrical apparatus preferred but not essential. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply personally, or by letter, to SUN ELECTRICAL CO., LTD., 118/120, Charing Cross Road, W.C. 3055

DISTRICT Engineer required, experienced in O.H. line work, and with good knowledge of plant on consumers' premises, &c.—Apply, stating all particulars and wage required, to SCOTTISH CENTRAL ELECTRIC POWER CO., 1, Kirk Wynd, Falkirk. 2877

DRAUGHTSMAN; permanent progressive position offered to capable man with knowledge of small switchgear, fuseboard and general accessory design. No one on Government work, or living over 10 miles from central London, need apply.—State age, experience and salary required, to 2902, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted by firm near London, starting manufacturing D.C. and A.C. motors, ½ to 15-H.P. Must have wide experience in the mechanical design of electrical machines. No person resident more than 10 miles away, or already on Government work, will be engaged. State education, experience, age and salary required. Management would be entrusted after trial.—3088, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMEN (Apparatus), required immediately by Controlled Establishment in London area, with good experience of telephone instruments and kindred apparatus, and magnetos for spark ignition. No person already engaged on Government work need apply.—Apply, stating age, experience and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A6254. 5896

DRAWN Wire Lamp Making Manager wanted, for small establishment; London district. Good prospects for practical man with a knowledge of exhausting, &c. No person resident more than 10 miles away, or already on Government work, will be engaged.—Applications in strictest confidence, to 5915, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRIVER Attendant wanted for A.C. turbine plant, for a factory in the North of England.—Apply giving experience, 3041, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAL Engineer, well qualified and experienced in design and manufacture of electrical instruments and apparatus, is required by an old-established firm to undertake the development of that particular branch. The terms of engagement would be mutually arranged on a satisfactory basis for one who could obtain successful results. The works are equipped with the latest type of machine tools for rapid manufacture of precision instruments of Admiralty and similar high-grade quality. No person resident more than 10 miles away, or already on Government work, will be engaged. Applications will be treated confidentially.—5881, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN and Mate required. Accustomed to general lighting and bell repair work. No person resident 10 or more miles away need apply.—KNIGHT, Gerrards Cross. 5798

ELECTRICIAN wanted, to look after C.A.V. lighting on fleet of motor-buses.—Apply MANAGER, Tramways Co., Oxford. 2978

SITUATIONS VACANT.—*Continued.*

ELECTRICIAN wanted immediately for plant and installation repairs. Must have good knowledge of oil engines and be ineligible for military service. Permanent work and good salary. No person resident more than 10 miles away, or already on Government work, will be engaged.—3078, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER of Methods, for Planning Department, required immediately by Controlled Establishment in London area, 2,000 employés, for small and accurate repitition parts of electrical instruments. Electrical knowledge essential. Applicants must be first-class mechanics, and be able to organise a growing department. Preference given to one with knowledge of piece rates. Only applicants having held a similar position need apply. No person already engaged on Government work need apply.—Apply, stating fully, experience, age and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A6255. 5895

EXPERIENCED Foreman or Forewoman required to take charge of flashing and mounting department, carbon filaments. No person resident more than 10 miles away, or already on Government work, will be engaged.—9728, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOREMAN, electrical control gear.—Wanted by large electrical firm in Manchester district, a first-class practical man to take full charge of department on heavy control gear for steel works, &c. Only those with successful record in similar capacity need apply. No one already on Government work will be engaged.—Apply to your nearest EMPLOYMENT EXCHANGE, stating age, experience in full and salary required, mentioning No. A6186. 2892

FOREMAN Electrician required at once; must be thoroughly conversant with all telephone systems and able to control men; permanency to the right man. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply, with copies of testimonials and stating experience and salary required, to 5911, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOREMAN Electrician wanted, used to supervision of men engaged on all classes of electrical work. No person already on Government work will be engaged.—Apply nearest EMPLOYMENT EXCHANGE, stating experience, salary, &c., and mentioning No. A6280. 5877

HEAD Storekeeper required, used to the handling and despatch of all kinds of electrical material. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply in confidence, by letter only, giving particulars of experience, age, salary expected, to R. W. S., Drake & Gorham, Ltd., 67, Long Acre, W.C. 2. 3040

MANAGER (Electrical) for large wholesale firm in Scotland, for duration of War only. Must have a thorough practical and technical knowledge of the trade, and be conversant with all Admiralty and War Office requirements; first-class commercial experience and exempt from military service; salary £300 to £350.—Address, with full particulars, 3027, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MANAGER, Winding Department.—Thoroughly trained Engineer, experienced in small and medium sizes Motors, able to work out windings (D.C. and A.C.). Applicant should detail experience, and state salary required. No person resident more than 10 miles away, or already on Government work, will be engaged.—2922, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MATHEMATICS.—Wanted, full time Instructor, one having a knowledge of electrical matters preferred, for classes of discharged sailors and soldiers.—Apply, stating age, qualification, any previous experience, accompanied by copies of two recent testimonials, to W. A. HARWOOD, Principal, Technical Institute, Gladstone Road, Wimbledon, S.W. 19. 5738

METER Repairer and Tester wanted. State experience, age and wages required. References required.—ELECTRICAL ENGINEER, Corporation Electricity Works, Grimsby. 3059

ORDER Clerk required in Electrical Motor Manufacturers' Works, North London, one with drawing office or technical experience preferred. No person resident more than 10 miles away, or already on Government work will be engaged.—Write stating qualifications and salary required to 3091, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PURCHASING Department require person to take charge of Progress Section, one with knowledge of materials for electrical mannfacturing preferred. No one at present engaged on Government work, or residing outside a 10 miles radius, need apply.—State age and wages required, to 3054, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PURCHASE Clerk wanted for the Electrical Department of a large industrial company. Experience in handling all requirements for power and lighting essential. Some technical experience desirable.—Apply, stating age, experience and salary required, to 3061, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

RATE Fixer required immediately by Controlled Establishment in London area, with experience of coil winding and small assembly work. Only those with first-class mechanical knowledge need apply. No person already engaged on Government work need apply.—Apply, stating age, experience and salary required, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A6256. 5893

REQUIRED, capable Man as Assistant for the Electrical and Engineering Section of the Buying Department of an important company. Commencing salary, £250.—Reply, giving full particulars of experience and copy testimonials from past employers, to Z. S., 878, care DEACON'S, Leadenhall Street, E.C.3. 3052

REQUIRED, Engineer's Fitter, experienced in the maintenance of Babcock, Wilcox and Dry-back Boilers. Reciprocating and Turbine Engines and Auxiliary Plant of Electric Power Station. No person already engaged on Government work need apply.—Call your nearest EMPLOYMENT EXCHANGE, quoting No. A 6290. 3071

REQUIRED, for the office of a large engineering company, thoroughly experienced Shorthand-Typist; one accustomed to engineering terms preferred. No person resident more than 10 miles away, or or already on Government work, will be engaged.—Apply, stating salary, to 3046, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REQUIRED immediately, a Capable Man for testing, recalibration and repairs of A.C and D.C. Meters and Instruments generally.—Apply, with full particulars of experience together with salary required, to GENERAL MANAGER, Power Station, Downing Street, Smethwick. 3092

REQUIRED, two Adult Males and one Junior, suitable for preparation of manufacturing layouts. Must be capable of calculating weights and quantities of material necessary for manufacturing articles used by telephone and electrical engineers, and able to read drawings, micrometers, define and describe sequence of operations. Progressive permanent berth. No man already engaged on Government work need apply.—Apply your nearest EMPLOYMENT EXCHANGE, mentioning No. A6267. 5892

SHIFT Engineer required for certified undertaking engaged on munitions work. Experience on Babcock & Wilcox boilers, turbo-generators and E.H.T. 3-phase supply essential. Salary 65s. (including war bonus) plus 12½ per cent.—Apply, with full particulars of experience, age, &c., to KENT ELECTRIC POWER CO., Railway Street, Chatham. 2925

SHIFT Engineer required power station in West of England, E.H.T., 3-phase turbos and mechanically fired. Boiler experience necessary.—Apply immediately, stating age and salary required (permanent appointment), 5776, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SHIFT Engineer wanted for small power station in the Midlands; A.C. and D.C. plant. Salary £3 per week, plus 12½%.—Copies of references and experience to 5866, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SHIFT Engineer wanted in a small D.C. electric supply station.—Wages, age and reference, to 3025, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SIX Men required, used to good class switch work; also six Armature Winders. No person resident more than 10 miles away, or already on Government work, will be engaged.—J. STONE AND CO., LTD., Deptford, London, S.E. 2944

STOREKEEPER and Packer required immediately. No person resident more than 10 miles away, or already on Government work, will be engaged.—3086, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

STOREKEEPER required for electrical contractor's business. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply, stating experience, salary required, to 5912, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

STOREKEEPER required who has had good experience in a modern stores dealing with all kinds of electrical apparatus. No person already engaged on Government work, or residing more than 10 miles away, need apply.—Apply, stating age, full particulars of experience, with dates and salary expected, to J. STONE & CO., LTD., Works Dept., Deptford, S.E. 14. 2966

SUB-STATION Attendant required, with experience of rotaries and H.T., 3-phase system; ineligible; permanent; 6s. 6d. per 8-hour shift, plus war bonus 23s. 6d. and 12½ per cent. weekly.—3053, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SWITCHBOARD Attendant wanted in a small D.C. electric supply station.—Wages, age and references, to 3026, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SWITCHBOARD Attendant wanted, Lighting and Tramway Station. Possible advancement to shift engineer when proficient. Wages £3 7s. 6d. weekly.—Apply WESTON-SUPER-MARE AND DISTRICT ELECTRIC SUPPLY CO., LTD., Locking Road, Weston-super-Mare. 2917

SITUATIONS VACANT.—*Continued.*

TECHNICAL Assistant wanted by motor control gear manufacturers in London district. Must be conversant with the details of design and manufacture of all classes of motor control gear. No person on Government work, or living more than 10 miles away, engaged.—Apply, stating age, experience and wages required, to 5772, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

THREE good Armature Winders and one Fitter, required, good positions for right men. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply E. M. C., 18, Gun Street, E. 1. 5829

TURNER and Fitter, with electrical experience; only highly-skilled man wanted. Highest rates paid. Comfortable working conditions. No person resident more than 10 miles away, or already on Government work, will be engaged.—Apply J. ORRICK, Messrs. Swarren, Ltd., 52/54, Theobald's Road, London, W.C.1. 5919

WANTED, a Cost Clerk, preferably with experience in cable and electrical manufactures. Must be capable of instituting and organising detailed costing department. Applications must contain full particulars of experience and salary required. No person resident more than 10 miles away, or already on Government work, will be engaged.—2995, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Assistant for Apparatus Department of Electrical Engineering Firm in the Midlands. Applicants should have good technical training. Nobody employed on Government work will be engaged. State age, experience and salary required.—Apply to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. A 6199. 2916

WANTED, Assistant in meter department and test room, A.C. and D.C. supply; certified undertaking; applicants should have had some similar experience; discharged soldier or ineligible preferred.—Write, stating full particulars, wages required, to MANAGER, Electricity Works, Bury. 3058

WANTED, by a firm in the S.E. district engaged on munition work, first-class Telegraph Mechanics. No person resident more than 10 miles away, or already employed on Government work, will be engaged.—State age and experience to 6125, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED by firm near London, Draughtsman for D.C. and A.C. Starting gear, ironclad materials. Must be systematic. No person resident more than 10 miles away, or already on Government work, will be engaged. State education, experience, age and salary required.—3087, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, by leading engineering insurance company, Electrical Surveyors, having good knowledge of the theory and practice of alternating and direct current plant. Applicants must be ineligible for the Army or Navy.—2581, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED by Leading Insurance Company, Electrical Engineers, to act as inspectors of electrical machinery; must have experience of A.C. and D.C. machinery and workshop training. Commencing salary £150 per annum, plus £35 war bonus, with increases according to merit.—State full qualification, age and experience, 3028, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Draughtsman experienced in laying out power station plant. Good wages to the right man. Manchester district.—3037, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Draughtsman for Switchgear Department of Electrical Engineering Works in Midlands. Nobody employed on Government work will be engaged. State experience, age, and salary required.—Apply to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. A 6200. 2915

WANTED Electrician for small three-phase plant, South Coast. No person at present engaged on Government work need apply.—Apply, with full particulars, to your nearest EMPLOYMENT EXCHANGE, quoting No. 5833.

WANTED, for Air Ministry contract, experienced Foreman Electrician, to carry out cleat and tube wiring and the installation of overhead and underground cables.—Apply, stating military category and wage required, to MACDONALD, GIBBS AND CO. (ENGINEERS), LTD., Didcot. 3089

WANTED, for Air Ministry contract, experienced Wiremen and Tube Hands. Full rate.—Apply, stating military category, to MACDONALD, GIBBS & CO. (ENGINEERS), LTD., Didcot. 3090

WANTED, for the Midlands, Electrical Instrument Maker for repair work; good wages paid to suitable applicant. Nobody employed on Government work will be engaged.—Apply to your nearest EMPLOYMENT EXCHANGE, mentioning this paper and No. A6248. 3017

WANTED, for urgent Government contracts, Instrument Makers; must have had experience with both moving coil and moving iron types of ammeters and voltmeters, for factory in N.W. district. No one already engaged on Government work, or residing more than 10 miles away, need apply.—Send full particulars to 3049, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

WANTED, General Assistant to Works Manager in an old-established electric lamp factory. Good opening and progressive salary. No person already on Government work will be engaged.—Apply your nearest EMPLOYMENT EXCHANGE, mentioning No. A5667. 2037

WANTED, General Hand for truck repairs; knowledge of wheel-press, overhauling and changing armatures essential. Wages 53s. 6d. per week of 56 hours.—Apply GENERAL MANAGER, Dover Corporation Tramways, Town Hall, Dover. 3065

WANTED immediately, by a London electric supply authority, Assistant in test room, used to the repair and calibration of A.C. and D.C. meters. Theoretical training essential. Salary £3 a week, including all bonuses up to date.—2967, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, in country near Windsor, Chauffeur; single man qualified to look after electric plant consisting of oil engine and battery, and to run motor car. Good quarters and wages, preference given to discharged soldier if well recommended. —Apply only by letter, to A.G., 7, Crosby Square, London, E.C. 5901

WANTED, Purchasing Agent; should have experience in purchasing electrical stores and fittings, works stores, &c. Applications must contain full particulars of experience and salary required. No person resident more than 10 miles away, or already on Government work, will be engaged.—2994, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Qualified Electrical Engineer with good mechanical knowledge for consulting engineer's office, chiefly dealing with iron, steel and mining work. State age, experience and salary.—2976, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, to qualify as leading hand after the war, a competent Electrician, used to all wiring systems, gas and oil-driven plants, and preferably with knowledge of hot-water work. No person already on Government work will be engaged.—Apply your nearest EMPLOYMENT EXCHANGE, mentioning No. A6292. 5885

WANTED, Wireman, wiring and general repairs (controlled firm); rate 1s. 6d. per hour, including all bonuses.—3043, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Works Manager, with special knowledge of Accumulator manufacture, preferably with experience of traction batteries. Must be practical, energetic and good organiser. Applications must contain full particulars of experience and salary required. Only first-class men need apply. No person resident more than 10 miles away, or already on Government work, will be engaged.—2996, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMAN, experienced in ships and works lighting and power installations. No person already on Government work will be engaged.—Apply, stating experience, &c., to nearest EMPLOYMENT EXCHANGE, mentioning No. A6280. 5878

WIREMAN for house wiring and general repairs.—Apply, stating wages, experience and references, to SUFFOLK ELECTRICITY SUPPLY CO., Felixstowe. 5775

WIREMAN (young) wanted; ineligible. Permanency offered.—State wages and experience to MANAGER, Carmarthen Electric Supply Co., Ltd. 3080

WIREMAN-Improver (smart), lighting, power. No person resident more than 10 miles away, or already on Government work, will be engaged.—LINDOW, 87, Parkhurst Road, Holloway. 5783

WORKING Foreman for electrical accessories manufacture, North London; small switches, &c. Good organiser and disciplinarian essential. Permanency for good man. No person resident more than 10 miles away, or already on Government work, will be engaged.—State age, qualifications and wages required, 5743, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

YOUTHS, 16½-17½ years of age, may receive full-day tuition and practice in Wireless Telegraphy; £3 10s. per term of 13 weeks.—Splendid chance of promotion for bright lads.—Apply W. A. HARWOOD, Principal, Technical Institute, Gladstone Road, Wimbledon, S.W. 19. 5739

SITUATIONS WANTED.

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Box Number and ELECTRICAL REVIEW address count as seven words.

A QUALIFIED Electrical and Mechanical Engineer desires a position as Inspecting Engineer or position of similar importance. Many years in this particular line.—5902, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER, A.M.I.E.E., with over 18 years' exceptional experience and technical training as cable engineer, desires re-engagement. — 5817, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS WANTED.—*Continued.*

ADVERTISER as Foreman, full control factory or large contracts, power and lighting, 26 years' experience; permanency required; shortly disengaged.—5821, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER wishes engagement as Electrician or Supervisor, power, lighting, or factory.—G., 137, Sulgrave Road, Hammersmith, W. 6. 5910

ADVERTISER (17) desires position as Improver. Two years' experience lift and motor work; outdoor preferred.—CATTERMOLE, 135, Coleman Road, Camberwell, S.E. 5. 5873

ALL-round Engine Fitter (practical) seeks situation in small firm on engines (internal, gas, steam, oil), or shop on small parts. —5868, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN Electrical Engineer, holding responsible position, with full technical and workshop qualifications, can shortly be at liberty. Large experience in high-tension and low-tension power and sub-station installations, running of plant, designs of switch-gear, and cabling.—5904, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN Engineer, at present employed on the commercial side of an electrical undertaking, desires position as Representative or Agent.—5804, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN Engineer, electrical and mechanical, accustomed to carrying out large contracts. Good organiser, and thoroughly experienced in the management of large numbers of men.—5831, ELECTRICAL REVIEW, 4, Ludgate Hill, London

CAR Painter seeks permanency on Tramways. Good all-round man; 20 years' experience on car work. Highest testimonials. —5757, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CHARGE Engineer desires permanent post; 16 years' sound experience, A.C. and D.C., &c.—Mr. B., c/o Baldwin, 47, Cliffe Street, Keighley, Yorkshire. 5928

DISCHARGED Army Officer (26), single, requires responsible post with manufacturing electrical engineering firm or other of high repute. Fully conversant with electrical matter, including Government contracts, having secured highest and varied experience with large engineers in London. Prepared to act as assistant to secretary, or would consider responsible position where electrical commercial experience can be utilised to the best advantage. Highly ambitious and truly energetic.—5760, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRIC Cable Works Manager and Engineer, 16 years' experience in the manufacture of all classes and grades of cable, desires similar position with reliable firm desirous of getting maximum output at lowest cost.—5774, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer, qualified, requires post in Australia or Colonies. Complete equipment and installation of works or factory plant, maintenance and management; A.C. and D.C. machinery.—5765, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer, specialising in three-phase generation, desires change and responsible position with large industrial concern. First-class theoretical and practical experience erecting and managing steam, electric and industrial machinery. Suitable post abroad after the war favourably considered.—5909, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer, with 14 years' first-class theoretical and practical experience of large plants, E.H.T., single, polyphase and D.C., seeks responsible position: specifications, drawings, erection and complete maintenance.—5827, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and mechanical Engineer (25), with good theoretical and practical training and good knowledge of power station works, seeks responsible post.—5782, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, with mechanical training, shortly disengaged, desires an appointment where ability and initiative are appreciated; charge of works plant or similar capacity. Commencing salary £5 per week; discharged service.—5918, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, with technical, practical and commercial training, requires situation as contractor's manager or similar appointment; 18 years' experience in estimating, control of men, interviewing, &c.—5803, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (33), A.M.I.C.E., A.M.I.E.E., with College training and experience in instrument and research work, desires responsible post.—5921, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN (Foreman), disengaged shortly, desires situation in shipyard or otherwise. Experienced shipyards (full charge), steel works, Admiralty work, electric welding, &c.; some commercial and drawing office experience.—5758, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS WANTED.—*Continued.*

ELECTRICIAN (24), experienced, seeks charge country house plant, gas or oil-driven. Army rejection, final.—SPRUCE, 38, Rockbourne Road, Forest Hill. 5930

ENGINE Fitter, seeks berth as foreman or charge hand of shop. All-round man.—5828, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINE Fitter (47) seeks berth as Foreman or Charge Hand, general, aero, gas, steam, or shop on small parts.—5867, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER, A.M.I.E.E. (discharged), desires permanent responsible position in London; 21 years' first-class experience. Accustomed to management of men, supervision of erection and running plant, installations, office routine and estimating.—5786, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER (27), electrical and mechanical, college graduate, desires responsible permanent appointment. Experience with leading firms in design, drawing office, central station, E.H.T. and L.T. and A.C. and D.C., power-house and works electrical plant management. Used to control of men. Good references, red card, low category. State salary.—5926, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FIRST-Class Winder, alternating and direct-current; 8 years' experience in manufacture and repairs, all types; good all-round mechanic; young and energetic; seeks charge or other responsible position.—"ENGINEER," 27, Chetwode Road, Balham S.W. 17. 5844

JOINTER, used to general mains work, motors, meters, locating faults, &c.—Apply W. C., 12, Mortimer Terrace, Highgate Road, London, N.W. 5. 5883

MANAGER or Foreman. Thorough experience in all branches, power, house and factory wiring, general estimating, &c.—5756, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MECHANICAL and Electrical Engineer, A.M.I.E.E., desires change. Grade 3. Age 40 years. 23 years' experience, manufacture, design, and administration. Specialising in telephones, telegraphs, cables, aeroplanes, and aeroplane engines. Excellent references.—5854, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

POSITION responsibility required firm electrical engineers, preferably instrument makers; well-educated man (23, low category); nearly six years' varied experience instrument work, good technical knowledge.—5876, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TO Electrical Cable and Wire-drawing Manufacturers.—A life-long practical expert in wire-drawing, who has laid down and worked plants at W. T. Henley's Telegraph Works, London, W. T. Glover, Trafford Park, Manchester, and others, wishes to meet firm either at present engaged in, or contemplating entering upon, wire-drawing, with a view to appointment as Superintendent Wire drawer. His services are immediately available.—Write to 5897, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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WANTED in London district by discharged soldier, a position of responsibility and trust, preferably in electrical trade, but not essential. Good character, education and testimonials.—MR. B., 10, Felix Avenue, Crouch End, N. 8. 5875

WORKS Foreman or Manager seeks situation. Ten years' practical experience; nine years supervisor electrical measuring, telegraph and wireless instrument making. Well up in progressive methods of machine and fittings shop. — 5785, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WORKS' Manager seeks berth; 13 years' practical and theoretical experience in supervising of winding shop; knowledge of small motors, fans, &c., unique; just disengaged. London district or South Coast preferred.—5903, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.).
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A WELL-KNOWN firm of Motor-Control Gear Manufacturers wish to appoint as Sole Agents for Ireland, an energetic firm established in that country.—5925, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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FOR SALE.

MACHINERY FOR SALE.

1000-KW. Turbo-Generator, A.E.G., 500 volts, 50-period, 3-phase, complete with two switch panels, surface condenser, electrically-driven air and circulating pumps, together with the piping and a quantity of new spare parts. The whole practically equal to new and ready for immediate despatch at Liverpool.

500-KW. Parsons Steam Turbo, 460/500 volts, D.C., in perfect condition, and complete with condensing plant.

Also 500, 256, 200, 185 and 160-KW. Belliss Generating Sets, 460/500 volts and 200 volts, D.C.

One Crompton, 150 H.P., 25 periods, 3-phase, slip-ring.

One Westinghouse, 14 H.P., 350/400 volts, 50 periods, 3-phase, slip-ring, 940 revs.

One Phœnix, 290 H.P., 460 volts, D.C., 400 revs., three bearings.

One 72-KW. Bipolar Compound-wound Generator, by Siemens, 110/120 volts.

Two 54-B.H.P. Rees Roturbo, 460 volts, with Reyrolle tramway-type starters, speed 1250 revs.

All the above are ready for immediate despatch.

Apply FRANK GILMAN, Lightwoods Hill, Birmingham.

Telegrams: "Gilman, Lightwoods, Birmingham." Telephone: 1081 Edgbaston. 3083

FOR SALE.

12-VOLT DYNAMO, 750 amps., two Commutators, 1150 revs. Almost new. Makers: Canning & Co.

140-volt Dynamo, 50 amps., 1030 revs. Makers: Greenwood & Batley.

Transformer, 3-phase, 500 to 220 volts, 50 periods; output, 15 K.V.A. continuously. Secondary pressure can be changed easily to 110 volts. Makers: Ferranti.

Alternating Motor Starter, large size. Makers: Erskine, Heap & Co.

55 yards double-wire armoured, 19/16, three-core Cable, Association; 2500 megohm grade.

Particulars from—

JAMES NEILL, LTD.,
1, College Place North,
Belfast.
5811

MOTORS AND FUSE BOARDS.

40-H.P., D.C. Motor, 500 volts, with back gear 5 to 1 hide pinion wheel, driven pinion silent, with starting panel, D.A. meter and D.P. switch and fuses. Motor and gear new.

Six 10-way D.P., 15 amps. per way, Ironclad Fuse Boards, Home Office pattern, with switches; also six Boards without switches.

Motors, A.C., 2 and 3-phase, also D.C., 220 and 440 volts, from 2 to 50 H.P., with rails, pulley, starting and switchgear with automatic features. Prompt attention and delivery given.

Apply— ROBUST MACHINERY,
62, Bradford Street, Walsall. 2950

ELECTRICAL PLANT FOR SALE.

ONE 300-KW., 220/250-volt Generating Set, comprising "Howden" enclosed compound engine, coupled to compound interpole Generator.

One 500-KW., 220/250-volt Generating Set, comprising "Belliss" enclosed compound engine coupled to compound-wound Generator, and complete with condensing plant.

One 450-KW., 500-volt Set, as above, with or without condensing plant.

THE PHŒNIX ELECTRICAL CO.,
32—36, Broomielaw,
Glasgow. 2429

OIL ENGINE AND MOTOR.

11½-H.P. Horizontal Oil Engine, by Gardner for sale, not yet removed from makers' case; immediate delivery can be given, and no certificate is required.

2-H.P. protected shunt Motor, by Vickers, with Blower suitable for five Smith's fires, in new condition.

5889, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

ELECTRIC PLANT FOR SALE.

TWO Sisson Engines, 10½" × 8", direct-coupled to series-wound Holmes Generators, each giving 500 volts, 20 amps. Also 16 Crompton Arc Lamps, 20 amp., double carbon type, to be sold with above or separately. All in good order. Make an offer, and—

"POST IT TO PULLARS,
CLEANERS AND DYERS, PERTH." 3075

(Continued on next page.)

FOR SALE.—*Continued.*

MACHINERY FOR SALE.

50-KW. Steam Generating Set, by Scott & Mountain: Vertical High-Speed Engines, direct-coupled to Dynamo. 500 volts, 100 amps., 500 revs.

25-KW. Direct-coupled Generating Set: Two-crank Compound Engines, Dynamo, 100 volts, 250 amps., 450 revs.

6·5-KW. Steam Generating Set, by Robey & Co., direct-coupled to Dynamo, 130 volts, 50 amps., 350 revs.

Compound-wound Bi-Polar Dynamo, by Scott & Mountain, 220 volts, 450 amps., 550 revs.

No. 3 Four-spindle "Acme" Automatic Screw Machine, for ⅝" bars.

Portable Electric Radial Arm Drilling Machine, by Kendal & Gent, 6′ arm, 2½″ spindle.

"Victor" Automatic Capstan Lathe, 9″ centres, 8′ bed, 2⅜" hollow spindle.

3″ Centres "Lo-Swing" Lathe, 8′ bed, take about 5′ between centres.

6″ centres, single-pulley drive variable-speed Lathe, by John Lang & Sons, on 12′ gap bed.

CATALOGUE of Stock MACHINERY. 2-3000 LOTS. Free on Application. Inspection invited.

THOS. W. WARD, LTD., ALBION WORKS,
Tel.: "Forward, Sheffield." SHEFFIELD.

R. H. LONGBOTHAM & CO., LTD., WAKEFIELD,
and at Milburn House, Newcastle-on-Tyne.

Tel.: { 44 Wakefield. / 867 Newcastle. Telegrams: "Engineer, Wakefield."

FOR SALE.

ONE 500-KW. triple-expansion Set, engine by Browett and Lindley, H.P. cyl. 17½″, I.P. 25″, L.P. 35″ × 14″ stroke. Single-phase Alternator, by British Westinghouse Co., 2100 volts, complete with exciter, &c.

One 225-KW. Generating-Set, engine tandem comp. type, 300 H.P., with Corliss Valve Gear, &c., B.T.H. Generator, 500 volts, compound wound.

One Parsons Steam Turbo, 1500 KW., 2-phase, 2000 volts, 50 periods.

One Willans-Parsons Steam Turbo Set, 1200 KW., with Alternator, 1200 R.P.M., 200 lbs. to sq. in., 11,000 volts, three-phase, complete with exciter, also condensing plant, air, and circulating water pumps, &c.

One Surface Condenser, by J. & H. McLaren, capacity 3000 cls. per hour, with circulating pump.

Two Exciters, 180 volts, 80/100 amps., 200 R.P.M. 5277

MACHINERY FOR SALE.

FOR Sale, one G.E.C. Generator, 110 volts, 73 amps., 4-pole, shunt, pulley, shunt regulator switchboard. Price £80. One Generator, 110 volts, 100 amps., 2-pole, shunt, 700 revs., carbon brushes. Price £38. One Keighley Motor, 4-pole, shunt, totally enclosed, 230 volts, 30 amps., 1200 revs., rails. Price £55. One 12½-H.P. Brook Motor, single-phase, 210 volts, 50 cycles, 1440 revs., squirrel cage, rails, pulley, starter. Price £55.

Barclay House, Helvellyn Street, Keswick. 3035

THREE-WIRE BALANCER BOOSTER FOR SALE.

THE Balancer Booster, by Siemens Bros., is suitable for an out-of-balance current of 50 amps. on the mid wire, with 440 to 500 volts on the outers. The two boosters, one on each side, are designed to take 100 amps. at 20 to 100 volts. The set, which runs at 1250 R.P.M., is mounted on a bedplate. Spare balancer and booster armatures are provided.

The set may be inspected at Tynemouth Corporation Electricity Works by appointment.

Offers and inquiries to be made to C. TURNBULL, Electricity Works, Tynemouth. 3031

ALTERNATOR AND MOTOR.

200-K.V.A., 3-phase Alternator, 500 volts, 50 cycles, 333 revs. 50-H.P. Motor, 720 revs., 200 volts, 50 cycles, two-phase.

HERCULES ENGINEERING CO., LTD.,
Charmouth Street, Leeds. 3032

CUNNINGHAM, LIMITED.

SMALL Motors and up to 300 H.P. rewound and repaired.

Estimates free. 171, Edgware Road,
'Phone: "5173 Padd." London, W. 2.

FOR SALE.—*Continued.*

ELECTRIC MOTORS FOR SALE.

D.C. MOTORS.

	H.P.	Volts.	R.P.M.	Winding.	Makers.	Type.
One	25	420	865	Com.	Holmes & Co.	Enc. vent.
,,	20	460/550	800	Shunt	B.T.H.	,,
,,	15	440	800	,,	Royce, Ltd.	,,
,,	15	230	840	,,	,,	,,
,,	8	230	480	Com.	,,	,,
,,	12	200/220	950	Shunt	Lancs. Dynamo	,,
,,	10	460	900	,,	Keighley Elec. Co.	,,
Two	13	420	1000	,,	Mather & Platt	Toty. enc.
One	10	420/440	1000	,,	Electromotors	Enc. vent.
,,	5	440	1250	,,	,,	,,
,,	5	220	1375	,,	General Elec. Co.	,,
Two	4	400	1150/1835	Inter.	,, ,,	,,
One	3	200	1275	Shunt	Delhi Elec. Co.	,,

A.C. MOTORS.

	H.P.	Volts.	R.P.M.	Phase.	Periods.	Makers.	Type.
One	27/30	350/400	720	3	50	Clayton Motors	Slip ring.
,,	12	420	960	3	50	Gen. Elec. Co.	,,
Three	3	420	1450	3	50	Wright & Wood	In. motor
One	5	100	1000	Single	50	,, ,,	,,

Catalogue of Stock Motors, Generators, Gas and Oil Engines free on receipt of request.

YARNALL & CO.,
Cornwall Street Ironworks,
Telephone: OPENSHAW 23. Openshaw,
Telegrams: "YARNALL, OPENSHAW." Manchester. 2913

MACHINERY FOR SALE.

MOTORS, SECOND-HAND.

All 230 volts, direct-current, complete with suitable control gear.

Quantity.	H.P.	Speed.
1	50	400
1	40	450/500
3	25	400
6	15	400
1	16	490
1	15	750
1	5	750
2	5	670
1	5	1000
1	2	1460
1	15	650

ALSO FOLLOWING PLANT:—

One 120-KW., 230-volt, 400 revs., steam-driven Generating Plant, Browett, Lindley two-crank compound engine, direct coupled Mather & Platt four-pole, compound-wound. Generator with spare armature.

One Main Switchboard, arranged for 10 circuits.

One Lancashire Boiler, 30 ft. × 8 ft.; insured for working pressure 160 lbs.; total heating surface 1,149 square ft.; two furnaces; grate surface 41½ square ft.; complete with all usual mountings.

All the above, in working order, can be seen under load, and full particulars given upon application or by appointment.

CAMPBELL & ISHERWOOD, LTD.,
Raleigh Street,
Bootle. 3004

BELLISS-E.C.C. SET.

ONE 250-K.V.A. Belliss-E.C.C. Set. Engine, vertical two-crank compound. Alternator, 333 revs. per minute. Pressure, 2,850 volts, 50 periods. Practically new.

3069, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

WEIGH-BRIDGE.

ONE Waygood's Weigh-bridge.
Five tons.

3070, ELECTRICAL REVIEW,
4, Ludgate Hill, London, E.C. 4.

MOTORS FOR SALE.

55 ⅛-H.P. Series Motors, 2000 R.P.M., voltages 70, 110 and 200, D.C.

24 ½-H.P. Shunt Motors, 100 and 200 volts.

3074, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

(Continued on next page.)

FOR SALE.—*Continued.*

VERTICAL GAS ENGINES.

FOR SALE.—Five Three-Crank Three-Cylinder Vertical Gas Engines, by British Westinghouse Co., Ltd., direct coupled to 160-KW. 480 to 500-volt D.C. Dynamos.

Two ditto, 130-KW., first-class condition. Can be seen as at work. Immediate delivery can be given.

A., Box 6817, Erwood's Advertising Offices,
30, Fleet Street, London, E.C. 4. 2955

E.C.C.-BELLISS SET.

THREE 200-K.V.A. E.C.C.-Belliss Sets, 2,850 volts, 50 periods. Three-crank compound engines, 150 lbs. Ready for immediate use.

3068, ELECTRICAL REVIEW,
4, Ludgate Hill, London, E.C. 4.

LAMPHOLDERS, LAMPS, &c.

FOR Sale at reasonable prices, from stock, Lampholders, Metal Filament Lamps, Switches, Cables, &c., &c.

DAVIS, 11, Sun Street, E.C. 2. 2780

ELECTRIC DYNAMOS AND MOTORS.

MACHINES always available for Sale or hire. ARMATURES and FIELD COILS rewound or repaired without delay.

'Phone: 5773 Holborn. MACDONALD, SYER & CO., LTD., 295, Gray's Inn Road, W.C. 1. 8485

FOR SALE.

250-KW. Belliss-E.C.C. Set, comprising Belliss high-speed, 3-crank, compound engine, direct-coupled to E.C.C. generator, 440/460 volts, D.C., 560 amps., 380 R.P.M., with Körting ejector compound, also spare armature. Can be seen running by appointment.—BURY ELECTRICAL PLANT CO., LTD., Phœnix Street, Bury. 2746

MAZDALIERS (B.T.H.).

FOR Sale, Quantity of 3 and 4-Light, in Cloister and Brass.

HIGGIN, LTD.,
265, Deansgate,
Manchester. 3034

MOTORS FOR SALE.

MOTORS IN STOCK, ready for immediate delivery, without certificates:—10-H.P. Totally-Enclosed, 220 v., 600 R.P.M., £64. 10-H.P. Compound Cutting, 200 v., 1170 R.P.M., £50. 10-H.P. Hodgson, 230 v., 1050 R.P.M., £62. 5 H.P., 480 v., 1170 R.P.M., £45, and several smaller.—E. P. ALLAM & CO., 107/109, Gray's Inn Road. W.C. 1. Holborn 1280. "Epaltrical, London." 2997

MACHINERY FOR SALE.

ONE Generating Set, consisting of 12 N.H.P. Loco-type Boiler and Compound Horizontal Steam Engine, by Davey, Paxman and Co., direct-coupled to 200-volt, 90-amp. D.C. Generator, by the Lancashire Dynamo & Motor Co.
About 2,000 yds. of No. 5 bare overhead copper wire.

STANLEY ENGINEERING CO., Bath. 5733

STEAM PUMPS.

TWO Worthington Dup'ex Steam Pumps. Capacity 1,800 gals. In good working order.

3067, ELECTRICAL REVIEW,
4, Ludgate Hill, London, E.C. 4.

GAS ENGINE AND PRODUCER PLANT.

140-H.P. Gas Engine and Producer Plant, together with 460-volt by 80-KW. Dynamo by E.C.C., new; makers' full guarantees.
Exceptional opportunity for firm requiring additional current.

Box 804, T. B. Browne's Advertising Offices,
163, Queen Victoria Street, E.C. 4. 3079

NEW AND SECOND-HAND MOTORS.

NEW and Second-hand Motors always available. Armatures and field coils rewound promptly.

ENTERPRISE MANUFACTURING CO., LTD.,
Gun Street Electrical Works, Bishopsgate, E. 1. 2898

FOR SALE.—*Continued.*

MACHINERY FOR SALE.

ONE Generating Set Comprising:—
"Howden" Enclosed Compound Engine for 150 lbs. steam pressure, direct-coupled to compound interpole generator, having an output of 300 KW. at 240 volts, 375 r.p.m.; built in 1910, and in first-class order.
Specification and print on request.

THE PHŒNIX ELECTRICAL CO.,
32—36, Broomielaw, Glasgow. 1943

WATER-TUBE BOILERS.

THREE Hornsby Water-tube Boilers, 160 lbs. pressure, rated at 10,000 lbs. per hour. Fitted with double steam drums, duplicate feed water supply valves, &c. Hand fired. Excellent condition.

3066, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

FUSE BOARD PARTS.

1500 Porcelain Bases	... at 11s. 0d.	per gross.
1500 " Bridges	... at 11s. 0d.	"
5000 Brass Contact Blades	at 3s. 3d.	"
5000 " " Clips	at 8s. 0d.	"
Brass Bus-Bar Strip	... ...	½" × ¾" × 3/16".

All the above for immediate disposal.

3084, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

Cheap prepaid Advertisements relating to second-hand goods and specified Articles are inserted under this heading at the rate of One Penny Per Word (minimum 1s.).

TRADE RATES ON APPLICATION.

Box Number and ELECTRICAL REVIEW address count as seven words.

BABCOCK & Wilcox Water-Tube Boiler, 1,530 sq. ft. heating surface, 160 lbs. working pressure, in first-class condition, for immediate delivery from stock.—HARRY H. GARDAM & CO., LTD., Staines. 2826

DRILLING Machine, up to inch, Champion make, 2-speed gear, pillar; also set Stocks, Dies, Taps, ¼ to ¾ Whitworth, all equal to new.—J. COFFIN, Builder, Victoria Road, Stoke Newington, N. 5886

DYNAMOS, 3000, 1500, 1000 and 750 amperes at 6 volts; also smaller sizes. Apply for lists.—CANNING & Co., Electro-Platers Engineers, Birmingham. 7769

ELECTRIC Light Plant, consisting of Crossley Horizontal Gas Engine; Holmes Dynamo, 140 volts, 60 amps.; D.P. Battery, 480 amp.-hour, 53 cells; Switchboard; all in excellent condition. Can be seen running by appointment.—ELECTRICAL ENGINEER, Electricity Works, North Camp, Farnborough, Hants. 5907

ELECTRIC Motors and Dynamos, Sale or Hire. Always a large stock of nearly new guaranteed machines. Immediate delivery.—ELECTRO-GENERATOR CO., 1A, Shepherd's Bush Road, W. 'Phone: 488 Hammersmith. 5347

ELECTRIC Pump, 3-throw, by Merryweather, with 5-H.P. 100-volt Motor, direct coupled, automatic starting gear.—MARTINS, 320, Witton Road, Birmingham. 5852

ELECTRICAL Accessories, few odd lots, cheap; list free.—M., 11, Pratt Street, Camden Town, London. 5899

FOR Sale, Double Commutator Generator, 2 × 300 volts, 30 KW., 960 R.P.M., with switchboard.—THE PHŒNIX ELECTRICAL CO., 32/36, Broomielaw, Glasgow. 2935

FOR Sale, Generating Set, 350 KW., 440 volts. 3-phase, 160 lbs. steam pressure.—2938, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, large quantity of heavy single and twin Conductor Armoured Cable, good for 500-volt work; also quantity unarmoured ditto.—PHŒNIX ELECTRICAL CO., 32/36, Broomielaw, Glasgow. 2937

FOR Sale, nearly new, 500-H.P., 460-volt, 150 R.P.M., Compound Interpole Motor, complete with starting gear.—THE PHŒNIX ELECTRICAL CO., 32/36, Broomielaw, Glasgow. 2928

FOR Sale, new Westinghouse Switch Cubicle, suitable for 200-H.P., 400-volt, 50-period three-phase motor.—THE PHŒNIX ELECTRICAL CO., 32/36, Broomielaw, Glasgow. 2932

FOR Sale, one Century Testing Set, by Elliotts, for direct current; one Elliott Testing Set, for alternating current; one Insulation Testing (Megger) Set, by Evershed Vignoles, in good condition.—H. JOHNSON, 261, Fosse South, Leicester. 5869

FOR Sale, one 1½-B.H.P. Gardner Vertical Engine (paraffin or petrol), direct coupled to Crypto dynamo, 25/37 v., 15 a.; 14 Exide Accumulators, 140 a.-hour capacity; control by panel switchboard with instruments; one 25-volt pedestal Fan, complete; one 25-volt Vacuum Cleaner; also number of 25-v., 10 and 15 W., lamps. May be seen in London. Price complete £175. Also one 1/10-H.P., A.C. Motor. 200 v., 50 W.; one 1/10-H.P. Motor, 200 v., 50 W.; one porthole Fan with regulator, 200 v., 50 W., by G.E.C.—Apply, by letter only, Box 211, ADVERTISING OFFICES, 84, Queen Victoria Street, London. 3036

(Continued on next page.)

FOR SALE.—*Continued.*

FOR Sale, seven 20-H.P., 500-volt B.T.H. Tramway Motors, with or without controllers.—THE PHŒNIX ELECTRICAL CO., 32/36, Broomielaw, Glasgow. 2934

FOR Sale, Small Petrol Lighting Set, complete on cast-iron bedplate, will run on paraffin; De Dion engine, Laurence, Scott dynamo, 100 volts, 12/15 amps.; good condition. What Offers? Also Elwell-Parker Dynamo, 50 volts, 40 amps., compound wound, in good condition. Price £25.—ROUCH & PENNY, 17, Prince Street, Bristol. 5870

FOR Sale, small Steam Set, suitable for ship or factory lighting, 60 volts, 160 amperes, nearly new.—THE PHŒNIX ELECTRICAL Co., 32/36, Broomielaw, Glasgow. 2933

FOR Sale, Storage Battery, by the Chloride Co., consisting of 135 17-plate Cells, complete with Stands, &c., and in perfect order.—Further particulars and price on application to 3051, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, Surface Condensing Plant for 500-KW. Engine.—THE PHŒNIX ELECTRICAL Co., 32/36, Broomielaw, Glasgow. 2930

FOR Sale, 5-H.P., 110-volt, 450-R.P.M., enclosed series-wound Motor, £26; 15-H.P., 400-volt, 50-period, 960-R.P.M., 3-phase Motor and Starter, £65; 25-H.P., 500-volt, 50-period, 960-R.P.M., 3-phase Motor and Starter; also spare Rotor, £125.—THE PHŒNIX ELECTRICAL Co., 32/36, Broomielaw, Glasgow. 2936

FOR Sale, 5-ton Electric Overhaul Travelling Crane, 38½ ft. span, with three 220-volt, D.C. Motors.—2929, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 50 and 150-KW., 220-volt multipolar three-bearing Generators or Motors.—THE PHŒNIX ELECTRICAL Co., 32/36, Broomielaw, Glasgow. 2931

FOR Sale, 60-KW. Peache-Siemens direct-coupled Steam Set, 430 volts, D.C.; can be seen running.—Apply WM. FRISBY, Borough Electrical Engineer, Electricity Works, Colchester. 3048

FOR Sale, 90-KW. modern Generating Set, by Brotwett, Lindley and Laurence Scott, 220 volts, 410 amps., 450 R.P.M. Engine, compound, developing full load at 160 lb. steam pressure on atmosphere; Generator, 6-pole compound wound; complete with new spare Armature, and ready for immediate delivery.—5888, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 290-KW. Belliss-Silvertown direct-coupled Generating Set, 600 volts, 490 amps., 350 R.P.M.; Generator, 4-pole, shunt-wound; and compound Engine. Complete with spare Armature and Shunt Regulator; enamelled slate Switchboard suitable for above, consisting of generator panel and two feeder panels, with instruments and D.P. circuit breakers, &c. The above plant is in thoroughly good order, open for inspection, and ready for immediate delivery.—83, The Exchange, Cardiff. 5887

GARDNER 5-horse vertical petrol paraffin Engine for sale, fitted with H.T. Bosch magneto, vaporiser, circulating pump, speed 800, suitable for direct coupling to dynamo, nearly new.—A. RUSHWORTH, Chigwell Row, Essex. 5914

GENERATING Plant for Sale, 500 and 900-KW., 500-volt Belliss Sets. Can be seen under load, and delivery can be given in about four weeks.—2927, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GENERATOR, 35 amps., 85 volts, 1730 R.P.M., semi-enclosed.—MARTINS, 320, Witton Road, Birmingham. 5853

HIGH-Tension Transformer, A.C., 250 volts, 50 period; Switchboard (elaborate), by Watson, X-rays complete, as new; photo description.—WINDRIDGE, Baths, Wolverhampton. 5908

MOTOR, 10 H.P., 440 volts, 1,380 revs., shunt-wound; in running order. Can be seen by appointment.—3042, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ONE 2-H.P. Mawdsley's Motor, 230 volts, 1350 revs., complete with Pulley, Starter and Bedplate.—Apply HARRY ROGERS, Electrical Engineer, Warrington. 3030

ONE 200-KW. Steam Generating Set for immediate sale, Willans-Mather & Platt, 220 or 440 volts. Perfect working condition.—JENNINGS, West Walls, Newcastle-on-Tyne. 1513

PLATING Dynamo, by Canning, 6 volts, 50 amps., with field regulator and voltmeter, and series resistance and amperemeter, new condition, £19; 1½-H.P., 200-volt, single-phase, 800 revs., Brook Motor, with starter, new, £32.—FRED H. JENNINGS, Electrical Engineer, Netherton, Dudley. 5871

PRIVATE Plant with Accumulators immediately available. "National" Gas Engine, 4 H.P.; Dynamo, 50/70 volts, 19 amperes; 28 Chloride 7-plate Cells, A type; with Switchboard. Seen running. Considered excellent order.—5916, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SECOND-HAND Steam Engine and Dynamo combined, 65 volts, 5 KW., in thorough working condition.—L. F. HADDRILL, 41, Mount Stuart Square, Cardiff. 5874

SINGLE-phase Bergmann Motor, 4 H.P., 110 v., 60 cycles, with starter.—MARTINS, 320, Witton Road, Birmingham. 5850

FOR SALE.—*Continued.*

STEAM Set, coupled, 100 v., 130 amps., 400 R.P.M.—WOODLEY, Crawley, Sussex. 5913

TELEPHONE Exchange, 48-line; G.E.C. make, perfect condition.—PHOTECTOR, Central Hall, Southall. 5764

TELEPHONES.—150, intercommunication, high-class instruments, plated metal bodies; Electric Fans, four, "Freezor" type; Amperemeters, four, Cromptons, 6" dials; Voltmeter, one, Cromptons, 6" dial; Dynamo, 100 volts, 7 amps.; Private Telephone Exchange for 120 lines.—COURT, 191, South Croxted Road, West Dulwich, S.E. 5898

THIRTY 210-volt, 60-watt, Osram Lamps, never been used, all perfect, 3s. 6d. each.—105, Loyd Road, Northampton. 5879

TWO 5-H.P. 400 volts enclosed shunt-wound Motors, in good running order.—AUSTIN WALTERS & SON, Gaythorne Electric Works, Manchester. 'Phone: 4109, Central. 3082

TWO 8-H.P. Motors, by Electromotors, Ltd., 480 volts D.C., semi-enclosed, 4-pole, shunt-wound, 1900 R.P.M.; one ditto, 5-H.P., by Linotype, 1450 R.P.M.—WESTERN ENGINEERING COMPANY, Swansea. 2943

3-H.P. Alvastor Oil Engine, magneto 19, very little used, £20; Cutting Dynamo, 65 volts, 10 amps., £12; ditto, 50 volts, 20 amps., £15; two Smoke Petrol Set, 33 volts, 10 amps., £18 10s.—LINSELL, Rayne, Essex. 5880

12½-H.P. Westinghouse Motor, 220 volts D.C., series wound. 760 R.P.M.—WESTERN ENGINEERING COMPANY, Swansea. 2942

12½-KW. Steam-driven Belliss-Westinghouse, 120-volt, D.C. Lighting Set. Immediate delivery; in new condition.—WESTERN ENGINEERING COMPANY, Swansea. 2940

14-B.H.P., Totally-enclosed, Compound-wound Mather & Platt Motor, 230 volts, D.C., 500 R.P.M., with or without magnetic brake of the "post"-type. Reversing controller and resistances.—WESTERN ENGINEERING COMPANY, Swansea. 2941

17-H.P., 440-volt, Shunt Protected Westinghouse Motor; speed 1500. Also 19-H.P. ditto.—DRUMMOND & Co., Middlesbrough. 5906

56-KW., 700-amp. Welding Dynamo, multipolar, belt-driven type, complete with spare armature.—DRUMMOND & Co., Middlesbrough. 5905

150-KW., D.C. Generator, multipolar type, 500 volts, with rope pulley; splendid condition.—HARRY H. GARDAM AND Co., LTD., Staines. 2952

190-H.P., six-pole D.C. Motor, by Ernest Scott & Mountain, 500 volts, arranged for rope drive.—HARRY H. GARDAM AND Co., Ltd., Staines. 2827

ARTICLES WANTED.

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STOCKS of Cable, Bell and Lighting Accessories, Lamps, &c., purchased for cash. Large and small quantities.

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ACCUMULATORS wanted for refining purposes. Obsolete Generating Sets, Dynamos, Motors, and all kinds of Machinery. Scrap Cable, Arc Lamps, Meters, Metal Residues, and Scrap Metals of every description purchased for prompt cash, town or country.—Apply A. BROWN & SONS, 142, Lower Clapton Road, London, N.E. Telephone: Dalston, 555. Telegrams: Secondhand, Lowclap, London. Established 1860. 4358

A.C. and D.C. Motors (second-hand), any type, any condition, wanted for prompt cash.—A. LEAROYD & SON, Bridge Works, Heatherley Street, Clapton, N.E. 5391

A. LEAROYD & SON, Bridge Works, Clapton, N.E.—Telephone Dalston, 2278; Telegrams: Frangible, Lowclap, London—buys for prompt cash every description of second-hand Generating Sets, Accumulators, Motors, Transformers, old Arc Lamps, Meters, Cable, Scrap Metals, Metallic Drosses, &c., &c. Enquiries solicited. Established over 50 years. 5392

A1 CASH Prices given for Electric Cable, Delcoblast Lamp Obscurer, Flexible Wire, Electrical Accessories, &c.—Apply DAVIS, 11, Sun Street, E.C. 2. 1424

(*Continued on next page.*)

ARTICLES WANTED.—*Continued.*

COMPLETE Electric Lighting Plant, 50/100 volts, for country house, with batteries and generator. — DUNHAM, Streatley House, Streatley, Dunstable, Beds. 5834

COMPOUND-wound Dynamo, 440 volts, 90 to 100 KW.; also 20 to 25-B.H.P., 440-volt Motor.—State full details and price, SIMPSON BROS., Hapton, near Burnley. 3039

GLASS Boxes for accumulators wanted. Quantity, 24; size, 19" long, 12" wide, 15" deep inside.—Send particulars and prices to HADDON-CAXTON ENGINEERING WORKS, Market Harborough. 3077

MOTORS wanted by industrial concern, from 5 H.P. to 30 H.P., complete with slide rails, pulleys and control gear; must be in good condition, 460 volts D.C. — State full particulars and price to 2986, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

NEW or Second-hand Tubing and Fittings wanted.—WALLACE, 58, High Street, Bloomsbury. 2307

ONE 10-H.P., 220-volt D.C., 1000 R.P.M., complete with starter.—5835, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PLATINUM, in any form and quantity, purchased at highest prices by DERBY & CO., LTD., 44, Clerkenwell Road, London.

PLATINUM Scrap purchased in large or small quantities. Highest market value given.—Before selling elsewhere call or post to the old and reliable firm, THE DEPÔT, 156, Charing Cross Road, London. Established 1850. 5882

SURPLUS Stocks Electric Cable, Plant, &c., bought for cash; also scrap cable, dynamos, motors, cells, scrap metals, lamp ends, &c.—LAKE, 132, Upper Thames Street, London, E.C. 5473

WANTED, a few 400-volt, 50-cycle, 3-phase Motors, preferably slip-ring type, 5 to 35 H.P.—8133, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, a good Vacuum Pump for Extracting Chamber about 1000 cubic inches.—Send particulars to 5872, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, an Induction Coil to give a 12" spark. Must be by good maker and in perfect condition. State lowest price.—3056, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, direct coupled high-speed Engine and D.C. Generator, about 50-KW., 220 volts, steam pressure 120 lbs.—Full particulars re makers, age, price, and where to be seen.—3081, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, direct-coupled Set, about 50/75 KW., 220 or 440 volts, D.C., preferably the latter. Full details and price must accompany offer.—2828, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Direct-coupled Steam Set, output 4/6 KW., 100 volts, steam pressure 100 lbs. — 5924, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Electric Cooking and Heating Apparatus, Kettles, Irons, Vacuum Cleaners, all voltages. Also Electric Bells, Lamps and Arc Lamp Carbons, and all classes of Accessories and Flexibles. — Fullest particulars to 2316, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Electric Cooking and Heating Apparatus Kettles' Irons, Vaccuum Cleaners, voltage 220.—Apply, with full particulars, to Mr. FRANK EVANS, Engineer, Electric Works, Llangollen. 3029

WANTED, Electro-plating Dynamo, 6 volts, 2000 amperes or thereabouts. State speed and price.—5884, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Generating Sets, all sizes, Boilers, Accumulators, Dynamos, &c., for export: also Scrap Cable and Metals, Complete plants purchased.—WILLIAMS & SONS 37, Queen Victoria Street, London. Telephone: 3938 City. 7000.

WANTED, Motor Generator: motor 100 volts, single-phase 50 periods; generator 50 amps., 25 volts.—5922, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Motor Generator: motor 100, 200 or 530 volts, D.C.; generator 20 to 30 volts, 50 amps.—5923, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, several Private Plants complete.—Apply GEORGE MORRISON, Birley Street, Blackpool. 2903

WANTED, Testing Sets, one Ohmmeter, 500 volts; one Millivolt and Milli-amps, Combination Set, or singly; any make, but in good order.—State price and make to HARRISON, Whitley Street Mill, Rochdale Road, Manchester. 5809

WANTED, two Plating or Depositing Dynamos for urgent war work, 1000/6000 amp. capacity, 3/15 volt. Only reliable machines will be considered, and if direct-coupled to motors. Full particulars of these should be given.—3085, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARTICLES WANTED.—*Continued.*

WANTED, vertical high-speed Gas Engine, direct coupled to about 10-KW. D.C. Dynamo, 220/230 volts.—State make, maker's No. and full details, to ELECTRICAL ENGINEER, Aldershot Gas, Water & District Lighting Co., Electricity Works, North Camp, Farnborough, Hants. 2972

WANTED, ½-H.P., A.C. Motor, 264 volts, suitable for City Electric Company's current (second-hand). — 5931, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 1-KW. compound Dynamo, 65 volts, moderate speed; one 250-watt compound Dynamo, voltage immaterial; one 8-volt, 10-amp., compound Dynamo; one 220-volt, ½-H.P. Motor; one 220-volt, ½-H.P. Motor.—5824, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 10/15-KW. Shunt Generator for 220 volts; bipolar machine will not be objected to. — 5890, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 20-H.P., 440-volt, D.C. Motor.—MARTINS, 320, Witton Road, Birmingham. 5851

WANTED, 20, 25, 30, and 40-H.P., 440-volt, shunt-wound, D.C., Electric Motors. Complete with starters.—3057, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 35/40 H.P. D.C. Motor, shunt wound; speed about 700 R.P.M.; suitable for 460 volts. State price and maker. —2878, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 70/100-volt, 20-ampere (about), Shunt-wound Dynamo.—105, Loyd Road, Northampton. 5830

WANTED, 250/300-K.V.A. Alternator, 200 volts, 3-phase, 50 periods, about 330 revs. — 5746, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

1/18, 3/22, 3/20 Single and Twin (lead-covered) Cable; 220 yds. 7/16 vulcanised, taped and braided (or lead-covered); 110 yd. length 7/16 (lead-covered, twin or concentric); direct-coupled Paraffin Set, Accumulators and Switchboard, small or large; small miniature type Accumulators; also 4, 6, 8, 12-volt portable type. — 5900, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

36 240/20-watt, S.B.C. clear crinkled, M.F. Candle Lamps wanted. —"DYNAMO," 3, Dundonald Road, Bristol. 5822

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EXPERT Mechanical Draughtsman; designing, standardising, drawing, tracing.—ELLIS, 67, Dale Street, Liverpool. 5927

SHEET Metal Work Wanted, any kind; best workmanship at moderate prices.—A. V., 26, Pindar Street, Bishopsgate, London, E.C. 5846

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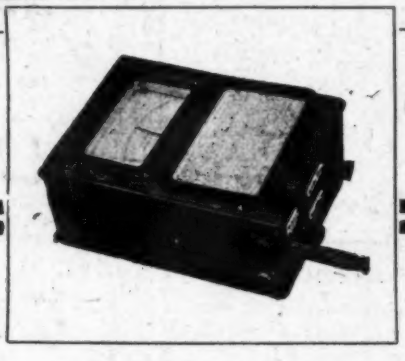

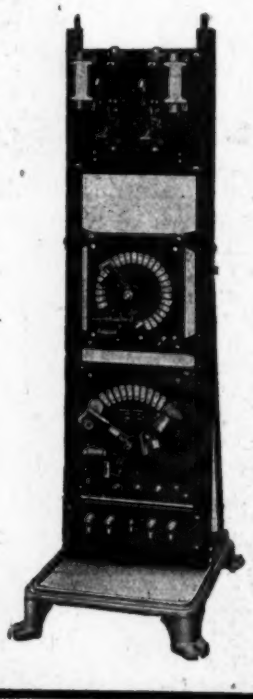

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Electricity Department.

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Specification and Form of Tender may be obtained from the undersigned on payment of One Guinea, which will be returned on receipt of a *bona-fide* Tender.

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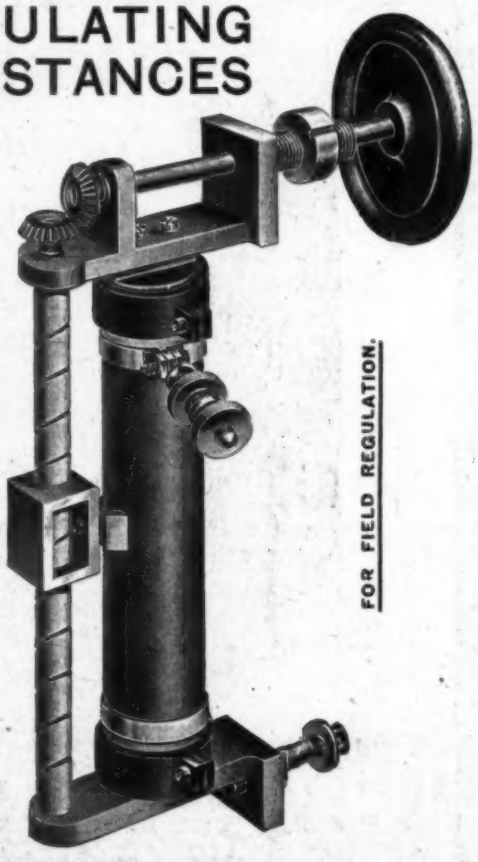

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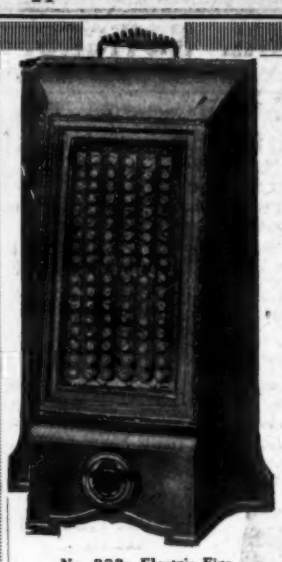

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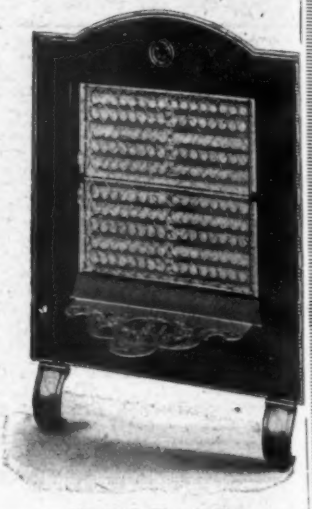

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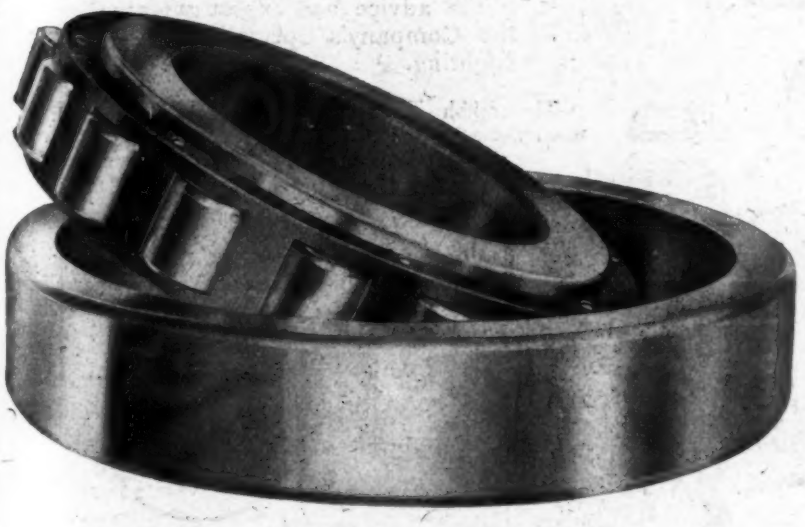

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Delay will be disastrous In a world so highly strung, and a world whose nerves have been strained for years, there is peril in an appearance of procrastination

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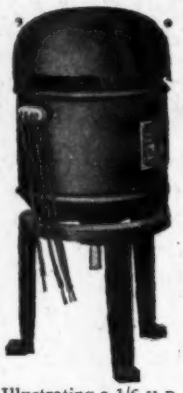

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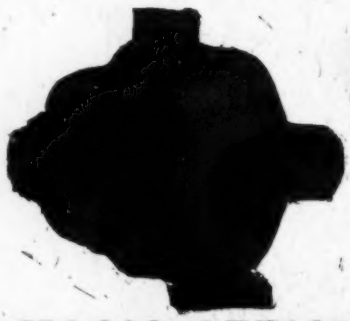

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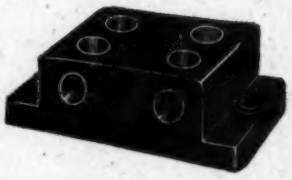

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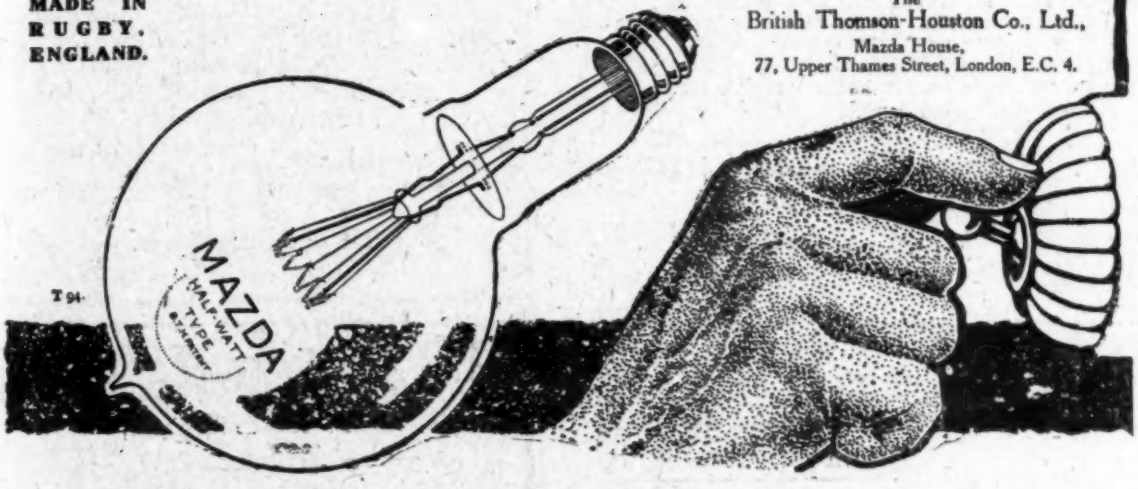

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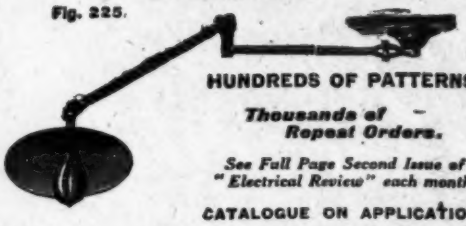

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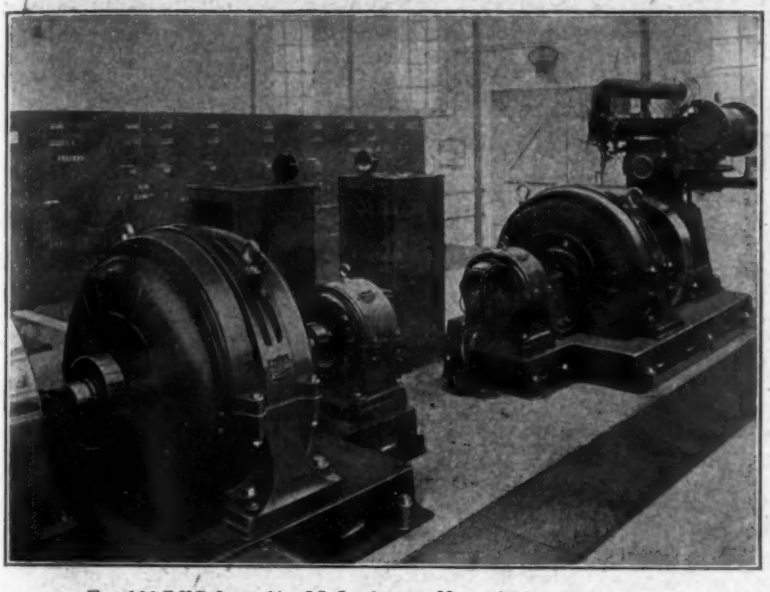

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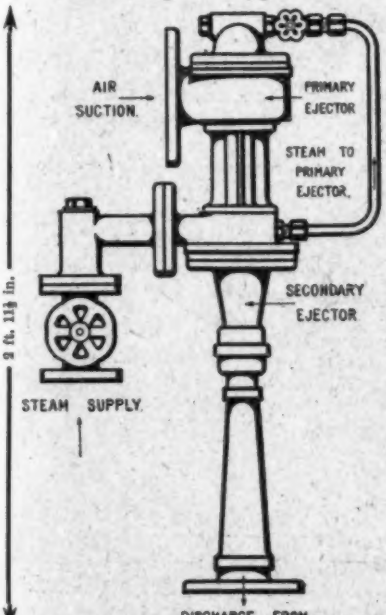

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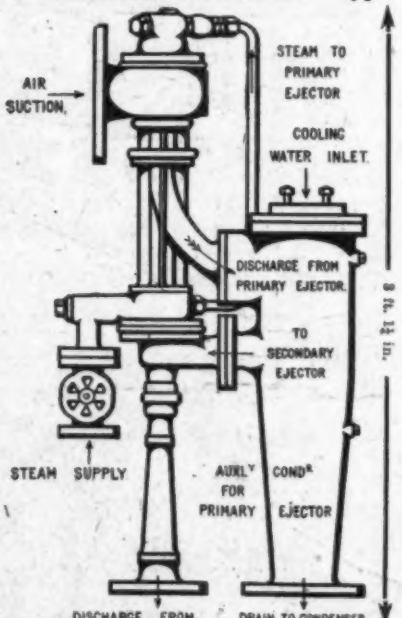

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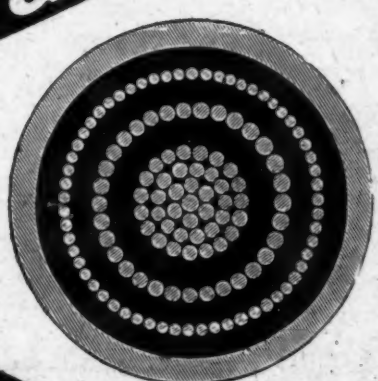

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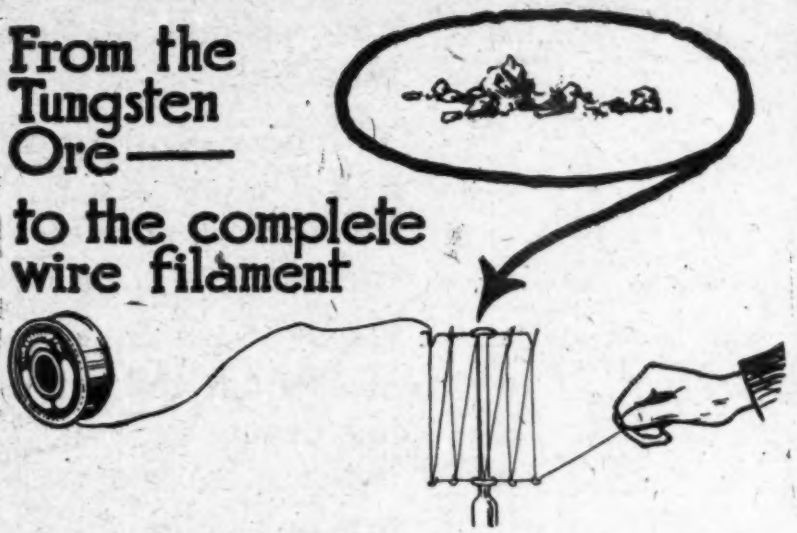

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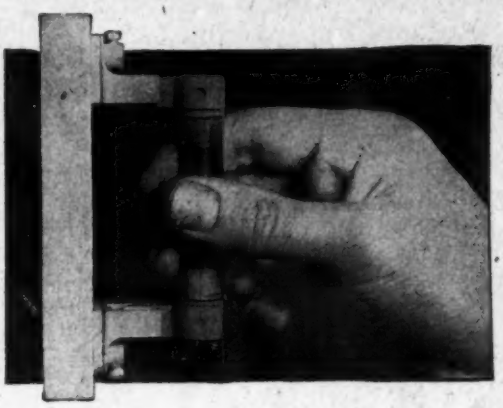

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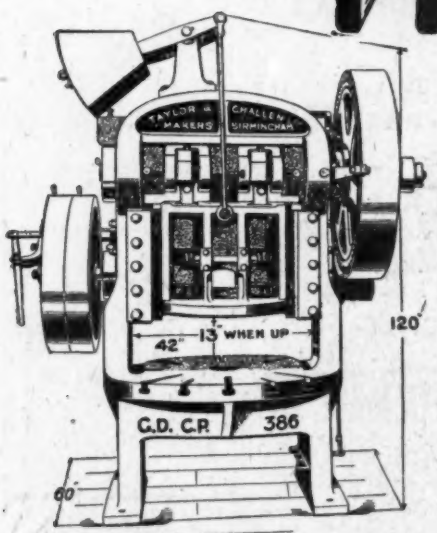

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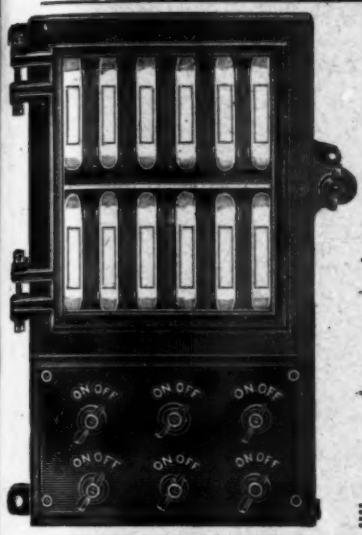

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FROM 100 to 150 HOURS' LIGHT.

The "Doralite" Lamp is of handsome appearance, strong construction and best finish, and is highly recommended for inspection and other service. The "Volex Duo" Battery supplied holds up well in stock, and is quite suitable for export.

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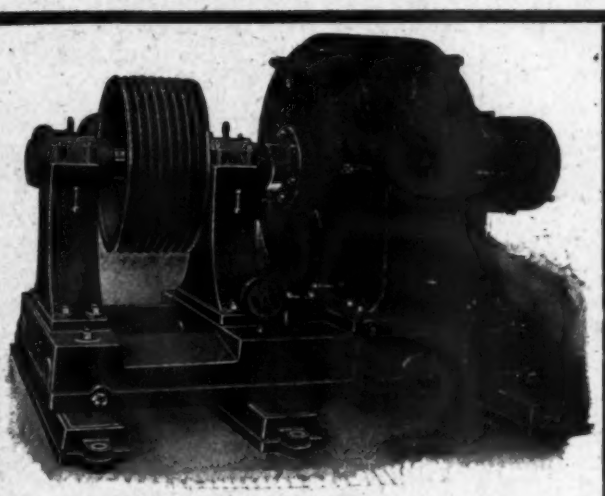
High-Tension SWITCH CUBICLES.



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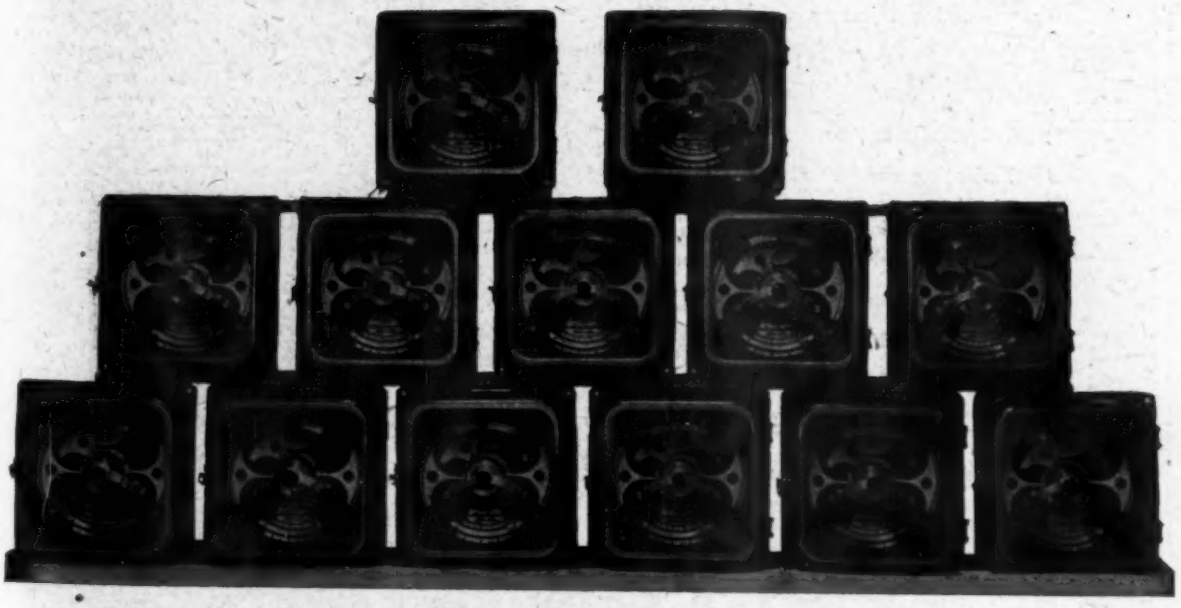

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MACHINE TOOLS

and Printing Presses.

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By speeding up to their fastest safe limit all operating functions.

By reducing the operator's task in starting, stopping or changing speed, to the simple pressing of a button at the working position.

By enabling speed to be altered without stopping or withdrawing the tool.

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By making every operation entirely mistake-proof and foolproof.

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By high quality of construction and freedom from breakdown.

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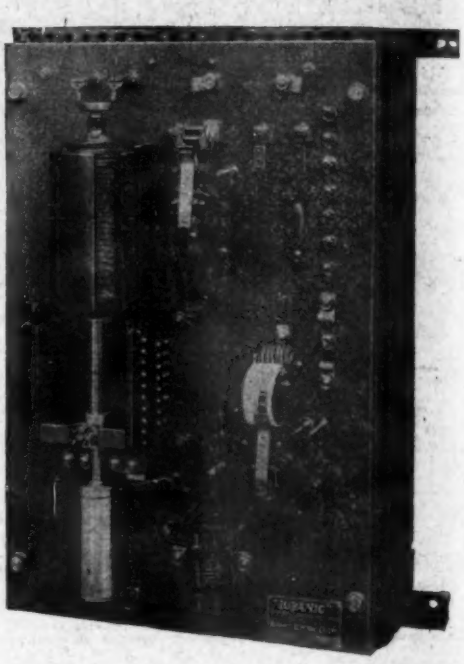

No. 260—Speed-Regulating Controller. Reversible and non-reversible, for direct-current motor drive. Gives wide speed range above and below normal.

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Printed by William Cate, Ltd., 147-150, Saffron Hill, E.C. 1, and Published by the Proprietors, H. Alabaster, Gatehouse & Kempe, 4, Ludgate Hill, London, E.C. 4.

Rotherham.—Utilisation of Waste Gases.—Under its new Act, the Corporation has obtained power to purchase crude or coke-oven gas, or waste heat, from any company or person within a large area surrounding the town, and also to lay mains to convey the gas to Rotherham. The Corporation is also authorised to install generating plant at any place within its electricity area where it is able to obtain waste heat.

South Africa.—The Mossel Bay (Cape Province) T.C. has appointed a Special Committee to inquire into the possibility of securing municipal electric lighting, and the Committee is making inquiries in various parts of the country.

Johannesburg.—Mr. J. B. Moffat, who recently held a Government inquiry into the causes of the strike amongst the Corporation's native employés, states that "the only conclusion that can be come to is that the Corporation's European employés having secured, as the result of a strike, a very substantial increase in their wages, the natives employed by the municipality followed the example of the Europeans, in the hope that their action would meet with the same success."

United States.—Women Meter Testers.—The *Electrical World* announces that the Department of Labour and Industry has refused permission to the Duquesne Light Co., Pennsylvania, to employ women for the testing of electric meters, on the ground that such employment "would not be proper from a moral standpoint, inasmuch as such work would lead them into out-of-the-way places."

Weybridge.—Price Increase.—The B. of T. has refused to allow the Urban Electric Supply Co. to increase its charges to 8d. per unit.

TRAMWAY AND RAILWAY NOTES.

Australia.—Hawthorn Tramway Track.—The disclosures published concerning the construction of the Hawthorn tramway track are emphasised by a report of the newly-appointed engineer and manager to the Trust, Mr. S. Robertson. The report states that in many respects the construction of the track was not carried out in accordance with the specifications and conditions of the Trust. Mr. Robertson made 22 test-holes, and found that in 18 of them there was less than 6 in. of ballast under the sleepers, and in one case there was no ballast. The ballast was dirty and mixed with small stones and mud. The rails were full of kinks, and the gauge of the track varied from correct to 1 in. out of gauge. In a switch drain-box it was discovered that a pipe leading to the culvert was 6 in. higher than that from the drain-box, being an attempt, apparently, to make water run uphill. On curves, also, the rails had not in all cases been bent correctly. Mr. Robertson states that the overhead construction was not in all cases carried out according to plans; the trolley wire should have been 19 ft. 6 in. from the ground, whereas it varied from 16 ft. to 20 ft.; the wire was not straight on the centre of the track, and had not been properly set off at the curves. The report, which was to have been considered at the next meeting of the Trust, estimated the cost of extra work on certain sections at £7,188, these sections amounting to about one-fifth of the whole.—*Age.*

Melbourne.—Year's Working.—The report of the Tramway Board for the year ending June 30th last, states that the arbitrator awarded the sum of £335,000 to the Melbourne Tramway and Omnibus Co. as compensation. The company has appealed against this assessment, and it is anticipated that the appeal will be heard this month. The action of the Board against the company for breach of the covenants of its lease of the tramways from the Melbourne Tramways Trust was initiated in November, 1916; the Board has now completed its details, and is awaiting the company's defence. The Board's claim totals £565,182. In order to provide additional power at the Richmond power house, the engines are to to be transferred from the Rathdown Street, North Carlton power house to Richmond, and two 125-kw. motors will be installed at the former station to drive the haulage cables. A contract has been entered into for the supply of the motors, which are to be manufactured locally. It is hoped that both stations will be reconstructed by January next. In October, last year, a contract was entered into with the Australian G.E. Co. for the installation of electric lighting on the cars by means of Edison storage batteries. The work has been delayed, but some of the material has now arrived, and one section equipped. The whole of the 27 stations are also to be electrically lighted, and one-half of the work has been completed. Owing to the difficulty of obtaining new wire ropes, the Board fears that some of the services may have to be discontinued. The revenue for the year amounted to £903,020, and the expenditure to £514,453. After allowing for interest, £30,000 was transferred to the renewals reserve account, and £360,207 to the appropriation account, which now stands at £600,227. Passengers carried totalled 113,034,157, against 103,118,379 in the previous year, and 12,833,029 car-miles were run, against 12,423,929; the revenue per car-mile was 16·859d., against 16·261d.

Sydney.—New Cars.—The latest type improved tramway car, which is on its trial, and which was put into commission on August 21st, is on the model of the ordinary type of 80-seater, but the sliding doors have entirely disappeared, and their place is taken by a pull-down blind, of the same type as has been used on the open smokers' seats in the combination cars, but of a much improved type. On first sight these cars appear to possess more glass, but it is not so, as the glass of the sliding doors is utilised to take the place of the wood panels, behind which the doors used to slide, and which now make the cars much lighter and pleasanter. As these glass slides can be pushed up and down in summer and fine weather, the cars are practically open ones, but can be closed up, and yet be light in rainy weather. The strap-hangers' wants are catered for by wooden bars across the entire width of the car. The smokers obtain just half the accommodation provided, while the sliding glass windows are lettered "Smoking," which is equally visible by day or night. Improvements have been made in the destination boards, which are now on top at the front of the car, and can be operated from the inside by the driver. The side boards have also been improved, in that they are lighted from the inside, the same as those in front, and are also operated from the inside of the car by the conductor. It is now much easier for the driver to see passengers getting in and out, owing to the use of glass side windows. New styles of centre lights have been added, while the cars are painted the battleship grey, which has lately found favour with the department.

Bradford.—Wages.—The application of the women tramway workers for a wage of 21s. per week over pre-war rates has been met by the Committee on Production by an award of 18s.

Coventry.—Accident.—As the result of a collision, on Saturday, between two tramcars, a passenger was thrown off the upper deck of a car into the roadway, and killed.

Dearne (Yorks.).—Light Railway Order.—The Joint Committee incorporated by the Dearne District Light Railway Order, 1915, has applied to the B. of T. for an extension of time to November 8th, 1919, for the completion of the railway sanctioned by the Order.

Huddersfield.—Wages.—The Tramways Committee has considered an application of the Tramway Workers' Union for a revision of rates of pay and hours of working of its employés, and has decided that the scale of wages be not altered, and the question of hours and Sunday labour be the subject of a report by the chairman and deputy chairman of the Committee.

Kingston-on-Thames.—Accident.—Two electric tramcars, running through Cambridge Road, on Thursday morning last week, collided at a point where double and single tracks meet. The fronts of both cars were completely wrecked, but the drivers escaped uninjured. Both cars carried a heavy load of passengers, who were thrown to the floor, and a dozen persons were more or less seriously injured. Three were taken to hospital, but the others, after treatment by local doctors, were able to proceed to their homes.

Leeds.—Proposed Extensions.—Further proposals with regard to tramway developments, in connection with the town planning scheme, are being considered by the Improvements Committee, and include lines from York Road to Seacroft, from Killingbeck to Crossgates, and from Harehills to Roundhay. The Committee favours a track laid on sleepers in the centre of the new roads, which are to be 125 ft. wide.

London.—L.C.C.—The Highways Committee, during the three months ended September 30th, settled 937 claims against the Council in respect of accidents arising in connection with the working of the tramways, at a cost of £6,744. Of 20 other cases in which actions were brought against the Council, 12 resulted in a verdict against the Council, and £956 and costs had to be paid; six were decided in the Council's favour, and two were withdrawn.

The Committee has completed arrangements for the sale of 10 tramcars to the Sheffield Corporation, at £550 each.

Arrangements have been concluded with the West Ham Corporation as regards overlapping workmen's fares, subject to an undertaking that the fares may be revised or withdrawn by one month's notice by any of the parties concerned, as follows:—The basis for 2d. return fares to be that already in operation on the Council's system, viz., four sections as against three for ordinary passengers; the 3d. return fares are not to be extended beyond the county boundary, but overlapping stages of approximately the same length as those in London, are to be introduced; the 4d. stages are to be a combination of two 2d. stages, and a maximum workmen's fare of 5d. return is to be arranged.

L.U.T. Bill.—The London United Tramways Co.'s Bill, which asks for powers to revise fares and to carry out financial reorganisation and reconstruction, was passed by the House of Lords Committee on Wednesday last.

Ludlow.—Proposed Light Railway.—A public meeting is to be held to consider the question of a proposed light railway from Ludlow to Doddington, *via* Knowbury.

Preston.—Parcel Service.—Tramways Committee has rescinded a former resolution to discontinue parcel delivery on the tramcars.

Sheffield.—Cable Explosions.—Two street explosions occurred in Sheffield recently owing to the failure of an underground tramway cable allowing current to leak to earth, with the result that the temperature in the cable box was raised, and the explosion forced the heavy metal cover off the box at two points. The explosions were followed by a fire, the cable insulation becoming ignited.

Worcester.—Wind Screens.—The City Watch Committee has received letters from the Electric Traction Co. with regard to the provision of wind screens at both ends of the cars. The company intimated that the directors only agreed to provide

screens in view of the strong pressure put upon them by the Watch Committee. They further stated that sickness among members of the staff was greater on cars where screens had been provided than where there were no screens, and that the drivers were quite satisfied with the arrangements made by them.

Wrexham.—ACCIDENT.—Two passengers were injured in a collision between two tramcars, at a loop-line junction at Wrexham, last week.

TELEGRAPH AND TELEPHONE NOTES.

Australia.—For having retained several documents which he had no right to do, Sydney Paul Morris, who had been an operator in the wireless telegraph branch of the Navy Service, was sentenced to three months' imprisonment, the accused having been found guilty on eight charges preferred against him. No suggestion was made that Morris had communicated the contents of the documents.—*Sydney Morning Herald.*

The Queensland storms a few months back did enormous damage to telephone and telegraph lines. The cost of repairs is officially set down at about £13 000.

Canada.—According to the *Times*, Mr. Justice Bruneau, of Montreal, has dismissed the petition of the Marconi Wireless Telegraph Co., which asked the Courts to issue an injunction to restrain the Canadian Car and Foundry Co. from installing certain apparatus for wireless telegraphy on ships under construction for the French Government at Port Arthur and elsewhere in Canada.

Confirmation of U.S. Cables.—The United States Censorship Board has published the following announcement:—"On and after October 1st, 1918, no confirmation of a cablegram shall be allowed to leave the United States, its territories, or possessions unless it be in plain language. On and after November 1st, 1918, no confirmation of a cablegram shall be allowed to enter the United States, its territories, or possessions unless it be in plain language. It is to be noted that code confirmations will not be passed by the Postal Censorship even when accompanied by what purports to be or actually is a translation thereof." In accordance with these regulations postal packets addressed to the United States containing the original text of code cablegrams will in future be stopped by the British Censorship.

Telephone Work for Blinded Soldiers.—The operating of telephone switchboards is one of the occupations for which blinded soldiers are being trained by the Australian Repatriation Department. At its central office in King-Street the Department has installed one of its blind trainers as a switchboard operator, with a view to submitting his training to the test of practical work. A slight modification in the switchboard has been made, so that the operator can feel with the tips of his fingers whether any particular shutter is up or down. When he hears a shutter fall, he passes his hands over the board to discover on which line the call is being made. He then has to find the corresponding socket, and insert the plug in the same way as with other boards; but he must do it by touch instead of by sight. The switchboard is a busy one, being connected with 15 lines, on which the number of calls is considerably above the average. The operator has beside him a Braille writing set for recording messages and making notes.—*Melbourne Age.*

The Telephone Service.—About 1,000 operators in the London Post Office service have been absent from duty, and subscribers have been asked to relieve the strain on the staff by limiting the number of calls to those that are strictly necessary, and by making calls, as far as possible, during the less busy hours of the day, instead of between 10 a.m. and noon, when the pressure of traffic is at the maximum.

London telephone girls, at a meeting on Friday last, passed resolutions calling for an immediate increase of wages and "the abolition of the reformatory-like discipline, the secret observation tables, and the use of stop-watches," and "a reduction in the work per individual." A resolution was passed demanding "an immediate increase of not less than the amounts stated in the claim recently submitted to the Arbitration Board, both for women and men telephonists."

CONTRACTS OPEN AND CLOSED.

OPEN.

Aberdeen.—November 21st. Great North of Scotland Railway Co. Six or 12 months' supply of stores, including telegraph material. Stores Superintendent, 80, Guild Street.

Bedford.—November 13th. Two water-tube boilers, mechanical stokers, and induced-draught plant for the Corporation. See "Official Notices" October 4th.

Bradford.—November 23rd. Tramways Committee. Stores for 12 months, including lamp fittings, insulating material, &c. General Manager.

Dublin.—November 7th. Gt. Northern Railway Co. of Ireland. Six or 12 months' supply of stores, including various electrical items. See "Official Notices" October 18th.

York.—November 1st. N.E. Railway Co. Telegraph apparatus, wire and line stores for 6 and 12 months. See "Official Notices" October 25th.

CLOSED.

Australia.—MELBOURNE.—City Council:—

300 5-amp. 230-volt meters, £720.—W. G. Watson & Co., Ltd.
200 10-amp. 230-volt meters, £522; 25 amp. 58s. each.—Warburton, Franki, Ltd.
40 15-amp. 400-volt meters, £185; 40 25-amp. do., £197; 30 50-amp. do., £162; 20 100-amp. do., £150.—Australian General Electric Co.
—*Tenders.*

Bradford.—Electricity Committee:—

Mechans, Ltd.—Four circulating water pipes, for Nos. 5 and 6 turbo-generators.
Bertram Thomas.—Switchboard for fan house at Valley Road.
Mather & Platt, Ltd.—100-B.H.P. A.C. motor and starter for Valley Road.
British Westinghouse Co.—Two 1,500-KW. rotary converters at Bolton Road works.

London.—L.C.C. The Highways Committee has purchased during the three months ended September 30th, 24,800 tons of coal and 4,000 tons of coke, for use at Greenwich power station, at a cost of about £58,300.

Material for alterations to coal shoots for eight boilers in connection with the burning of coke, £1,296; dismantling existing material and erecting new on a time and material basis of net flat cost, plus 25 per cent.—Babcock & Wilcox, Ltd.

ST. PANCRAS. B.C.:—

Two circulating pumps, £2,886.—Rees Roturbo Manufacturing Co., Ltd.
Mechanical stoker, £1,906.—Underfeed Stoker Co., Ltd.
Completion of steel work for coal-handling plant at King's Road Station, £2,777.—Strachan & Henshaw.

Salford.—Electricity Committee. Recommended:—

33,000-volt trifurcating box, switches, insulators, transformer, &c., in connection with the bulk supply by the Manchester Corporation, £395.—Callender's Cable & Construction Co.
Six machine stokers and accessories, £1,170.—E. Bennis & Co., Ltd.
One 500-K.V.A. three-phase transformer, £638.—British Electric Transformer Co., Ltd.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, November 1st. At 7.30 p.m. At 39, Victoria Street, S.W. Paper on "Engineering as Applied to Kinemas," by Mr. W. E. Dines.

Chief Technical Assistants' Association.—Saturday, November 2nd. At 3 p.m. At Anderton's Hotel, Fleet Street, E.C. Discussion on Mr. Murdoch's paper on "Voltage Regulation."

Society of Engineers (Inc.).—Monday, November 4th. At 5.30 p.m. At Burlington House, Piccadilly, W. Lecture on "Obstacles to Post-War Trade," by Sir Richard Cooper, Bart., M.P.

Institution of Civil Engineers.—Tuesday, November 5th. At 5.30 p.m. At Great George Street, S.W. Address by the President, Sir John A. F. Aspinall; presentation of medals awarded by the Council. (This is the opening meeting of the 100th session of the Institution.)

National Association of Supervising Electricians.—Tuesday, November 5th. At 7 p.m. At St. Bride's Institute, Bride's Lane, E.C. Paper on "Automatic Telephone Switchboards," by Mr. C. Bowman.

Institute of Marine Engineers.—Tuesday, November 5th. At 6 p.m. At The Minories, E.C. Paper on "Boiler Heating Surface: What is its True Value?" by Mr. G. J. Wells.

Industrial Reconstruction Council.—Tuesday, November 5th. At 6 p.m. At the Institute of Journalists, Tudor Street, E.C. Conference on "The Place of Conciliation and Arbitration in the Whitley Scheme," to be introduced by Mr. E. H. C. Wethered.

Roentgen Society.—Tuesday, November 5th. At 8.15 p.m. At the Royal Society of Arts, John Street, Adelphi. Presidential Address, by Mr. G. H. Batten.

Institution of Electrical Engineers.—Thursday, November 7th. At 6 p.m. At the Institution of Civil Engineers, Great George Street, S.W. Tenth Kelvin lecture, "The Dynamical Theory of Electric Engines," by Mr. L. B. Atkinson. Presentation of premiums awarded for papers read or published during the past session.

(South Midland Centre).—Tuesday, November 5th. At 6 p.m. At the Birmingham University. Presidential address by Mr. S. T. Allen.

Birmingham and District Electric Club.—Saturday, November 9th. At 7 p.m. At the Swan Hotel. Paper on "Automatic Telephones," by Mr. H. W. Dipple.

Manchester Association of Engineers.—Saturday, November 9th. At 6.30 p.m. At the Grand Hotel. Paper on "Workshop Measurements, with special reference to the Limit System," by Mr. W. F. Rhodes.

NOTES.

A Magnet Made of Silver.—While iron is the only metal that can be made into a really powerful magnet, the property is not peculiar to iron. Nickel and cobalt can both be magnetised, and show the familiar North and South poles, like an ordinary steel magnet. It has been discovered recently that silver can also be magnetised under certain circumstances. Some bars of exceptionally pure silver were heated to 130 deg. C., and left for some time in a strong magnetic field, in connection with some experiments on gravitational attraction, described in a paper read before the Royal Society. It was afterwards found that the silver had become weakly, but permanently, magnetised by this treatment.

Industrial Coal Economy.—The results of the industrial coal economy campaign are becoming apparent. From all parts of the country and from all classes of steam users, the Coal Controller daily receives letters announcing improvements of plant, consequent decrease in coal consumption and appreciation of the advisory work of his department.

For the purposes of this effort, which is under the charge of the technical department of the Coal Control, the country is divided into areas and districts, each with its engineer, whose function is to visit works, to consult with and advise the management how to secure efficient working so as to cut down the coal consumption. There are 400 engineers engaged in this work. In the United Kingdom there are between 40,000 and 50,000 steam users. Of these, 6,800 cases have been reported for attention, and the process goes on at the rate of 1,400 a week.

The principal directions in which fuel economy is being effected are by the improved lagging of boilers and steam pipes, repair of defective brick work in boiler flues, attention to leaky pistons and glands, and the utilisation of exhaust steam for heating purposes, and of the hot flue gases for heating boiler feed water. The use of unnecessarily high-grade coal for steam purposes is a prolific source of waste. This to an extent which represents a large aggregate saving is being remedied by the employment of lower-grade coal, thus releasing the better qualities for other purposes.

The small steam users who are using an excessive amount of steam, and consuming an excessive amount of coal, are receiving special attention. In many cases, where it has been possible to secure the plant, substantial economies have been made by the substitution of electric motors or gas engines for small steam engines. One large establishment estimates a saving of 40 tons of coal per week by means of electrification.

The estimate and aim of the technical department is that without any general scrapping of old and installation of new plant, a saving of 5,000,000 tons of coal per annum is practicable—provided that the economy movement has the active support and co-operation of all who work steam engines, from the managing director to the fireman who feeds the boilers.

The Coal Controller has issued figures which show a further serious falling-off in the estimated output of coal during the first 36 weeks of this year compared with the output during the corresponding period of last year; the net shortage is nearly 15½ million tons, or about 8.8 per cent. It is estimated that on account of disputes at collieries the output of nearly 435,000 tons of coal was lost. The stocks of coal at mines and in trucks on September 14th of this year were about three-quarters of a million tons less than at the corresponding date of last year.

The output has steadily improved during the last three months, partly owing to the return of miners from the Army, to the stoppage of the holiday season, and to a decline in the influenza epidemic, yet the demand for coal is greater than ever. Although the domestic rationing system is now in full operation, and the public is loyally responding to the demand for the most drastic economy in the consumption of fuel and light, the Coal Controller is faced with extra demands for many millions of tons of coal for the requirements of the advancing Allied Armies, for the Navy, and for the manufacture of munitions. Even if peace were to come quickly, there is no prospect of a solution of the coal problem other than the economical one.

Electric Arc-Welding Schools.—Three hundred men from the Ordnance Department of the United States Army will be trained as electric welders in the schools established by the electric welding section of the industrial relations group, according to an announcement made by H. A. Hornor, head of the section. These men will be used in the work of reclamation of war materials gathered from the battlefields of France. A special branch for handling electric welding problems and for training electric welders has been established. The service is free to shipbuilders, or those aiding shipbuilders, or doing important work for the Government. The schools are at Schenectady, N.Y., New York City, and Cleveland, and one is also being started in Philadelphia.—*Electrical World.*

Industrial Councils: Co-ordination Wanted.—The chemical trade, one of the first to apply the principles of the Whitley Report, is not satisfied merely to have a Joint Industrial Council. It now announces a further step in the appointment of six "special commissioners," who are to be ready "on a telegraphic summons to go at once to any place in which a question has arisen which cannot be settled by the Works Committee or the District Council." At first glance the notion of a travelling conciliation commission of employers and trade unionists looks admirable. Procrastination, as we know, has been one of the most fruitful causes of unrest in the past, and anything tending to hasten the hearing of differences should have a good influence. But there is a danger which must be plainly marked at the outset. Suppose an establishment-worker, an electrician, say, at some chemical factory raises a difficulty which cannot be settled without the intervention of the travelling Commission. Is it to be within the power of the Commission to order a change of working conditions which will create a precedent for every electrician outside the chemical trade? The point is extremely important, for it will readily be seen that whereas such a change might affect only two or three men in a chemical factory, an electrical factory might find every man in its employment presented with a grievance. This has always appeared to us to be the fatal weakness of the Whitley scheme. It provides no method of co-ordinating different trades employing the same classes of labour. Developments like this are certain to lead to trouble unless a co-ordinating body is set up. What is wanted is a Federation of Joint Industrial Councils. This body could be brought into existence at once through the more broadly constituted of the employers' federations and the corresponding labour organisations.—*The Employer.*

Science Expels "Kultur."—The Inter-Allied Conference on the future of international organisation in science, which met in London last month, unanimously adopted a number of resolutions dealing with the withdrawal of the Allied nations from existing international associations, and the substitution of new associations in their stead. The Conference declared that the traditional fellowship and co-operation of scientific men of all nationalities had been destroyed by the atrocious conduct of the Central Powers, which had broken the ordinances of civilisation and forfeited the esteem of the civilised world. Hence the Allied nations could not resume personal relations in scientific matters with the guilty nations until the latter had renounced the political methods which had led to the atrocities that had shocked the world.

On October 23rd the French Academy of Sciences confirmed the resolutions above mentioned.

Decimal Coinage and the Metric System.—The Decimal Association has reprinted a searching commentary by Mr. Harry Allcock on the findings of Lord Balfour of Burleigh's Committee with regard to the proposed introduction of metric weights and measures and decimal coinage, which was published in *Nature* of June 6th, 1918. With reference to the statement in the report to the effect that though the use of the metric system had been permitted for 20 years, it had not gained adoption, the author pointed out that it was obviously impracticable for tradespeople and manufacturers to adopt the system individually. He exposed the fallacy of the statement that the adoption of the metric system would involve changes in the dimensions of spare parts, &c., or in the equipment and working of factories, and remarked that if we did not adopt the metric system outright, we should be compelled to use both systems for ever. With regard to our export trade, Mr. Allcock pointed out that the British Dominions all wished for the change, and that if Great Britain adopted it, the United States would quickly follow the example; in order to forestall German competition, we ought to act promptly. On the subject of decimal coinage, the author emphasised the inability of our existing monetary system to cope with fluctuations in prices without great injustice to the poor in the case of low-priced articles, and he advocated book-keeping with three columns for cash entry as at present, but headed respectively, pounds, florins, and mils, to avoid the use of three figures after the decimal point. The coinage question is at present being considered by a Royal Commission.

Copies of the pamphlet can be obtained gratis from the Decimal Association.

A general meeting of the Decimal Association is to be held on Thursday next, November 7th, at 3 p.m., at the Manchester Hotel, Aldersgate Street, E.C.1., to receive the report of the Executive Committee, adopt rules, and elect members of Committee.

Variation of Resistances at High Temperatures.—Measuring the electric resistance of some metallic oxides at high temperatures in a vacuum and in a nitrogen atmosphere, Emil Podszus noticed striking differences in the two series. The investigation was not completed as Podszus had to join the army last year; however, he gave a preliminary account of his experiments in the *Verhandlungen der Deutsch. Physik. Gesellschaft* of October 30th, 1917. According to *Engineering*, the specimens were small compressed rods of the carefully purified oxides, about 1.3 mm. thick, 10 mm. long, and were heated in a small electric furnace formed by a spiral of tungsten tape, 0.2 mm. thick, suspended in a glass globe, which was evacuated to 1 mm. or 2×10^{-4} mm. of mercury or filled with nitrogen at atmospheric pressure. The globe was previously heated to 400 deg. C.; for the measurements the spiral was heated up to 2,000 deg. C. by alternating currents. The oxides examined were CaO, MgO, Al_2O_3, ThU_2, and further boron nitride BN. In all the cases the resistance decreased greatly as the temperature was raised, in the case of calcium oxide from 1,330,000 ohms at 1,510 deg., to 80,000 ohms at 1,690 deg., and in most cases the resistance was found to be much smaller (only about half) in the nitrogen atmosphere than in the vacuum. In the case of alumina there was very little difference in the two series, however, the resistance being 3,380,000 ohms at 1,550 deg. and 410,000 ohms at 1,775 deg.; we leave out the intermediate values. But the boron nitride showed much higher resistances in the nitrogen than in the vacuum, the figures being: 6,000,000 ohms at 1,620 deg., 1,300,000 ohms at 1,750 deg., 230,000 ohms at 1,930 deg. in nitrogen, and 700,000 ohms and 100,000 ohms at 1,680 deg. and 1,840 deg., respectively, in the vacuum. Dissociation of the compounds and thermionic currents would affect the resistance in addition to temperature.

Volunteer Notes.—Royal Engineers (Vols.), London Army Troops Companies.—Headquarters: Balderton Street, Oxford Street, W. 1.

Corps Orders No. 45, by Lieut.-Col. C. B. Clay, V.D., Commanding.
Captain of the Week.—Capt. W. Darley Bentley.
Next for Duty.—Capt. E. G. Fleming.
Sunday, November 3rd.—Annual musketry course at Pirbright. Parade, Waterloo Station, 9 a.m. Drill order, with rifles and great coats. Mid-day and tea rations to be carried.
Monday, November 4th, to Saturday, November 9th.—Drills as usual.
Sunday, November 10th.—Commandant's Parade at Waterloo Station, for work at Esher, 9 a.m. Drill order and great coats. Mid-day and tea rations to be carried.

C. Higgins, *Capt.* R.E., *Adjutant.*

Chemical Technology.—According to the *Times*, a scheme has been drawn up for the post-war development, under Prof. W. A. Bone, of the Chemical Technology Department of the Imperial College of Science and Technology at South Kensington, involving an outlay estimated at £100,000 for buildings and equipment, and a cost of not less than £10,000 a year for maintenance and working expenses. It is proposed that the Department shall be organised in four principal sections. The first will be concerned with the general technology of fuels, carbonisation of coal, distillation of wood, chemistry of coal tar and its derived products, chemistry of gases and technical gas catalysis, and refractory materials used in furnace construction and the manufacture of ceramics, glass, and cements. In the second, or Chemical Engineering Section, facilities will be provided for the advanced study of the operations required in chemical manufacture, including factory economics and organisation; while the third will cover the principal applications of electricity in chemical industry. In the fourth section various groups of chemical products will be dealt with.

Fuel Economy Exhibition.—A Fuel Economy Exhibition, organised by Lady Rhondda's "Win the War" Committee, will be opened in Trafalgar Square on November 18th. The object is to show people how to economise their coal and light rations by making use of the means to hand without having recourse to expensive patent appliances. No materials will be used which cannot easily be obtained in an ordinary household. The exhibition will be open for a week, and on each day an expert will lecture on practical means of economising.—*The Times.*

Cable, Electric, D 1.—

As a supplementary bivvy-string this cable's unexcelled,
It will last you duration and a day;
As a substitute for headropes, which the Q.M. has withheld,
It is useful, for it does not break or fray.

If you're using Jordan rushes for the building of a mess,
It's invaluable for binding and for guys;
And without it, it is useless your endeavouring to dress
Lines of saddles, tents, or bivvies soldierwise.

For a ration or a forage dump that has to be enclosed
Only angle irons and cable you require;
If you want to measure distances, the Signals are disposed
To advance you quarters, halves, or miles of wire.

As a clothes-line it is matchless and for tying rolls of kit;
It's been known to clean a pipe that wouldn't light;
It has lately been discovered that a splendid use for it
Is to guide patrolling officers at night.

But for telegraphic purposes this cable is a dud—
Be advised, and never use the stuff for this;
It lies ambushed on your path and trips you sprawling in the mud,
Yet whene'er you wish to telephone—it's "dis."

[The foregoing verses appeared in the *Palestine News* for September 19th, and were forwarded to us by Mr. J. H. C. Brooking. We shall be glad to hear from the author if he sees these lines.—Eds. Elec. Rev.]

Electrical Engineers on Board Ship.—Standard rates of pay for our Mercantile Marine have been settled by the National Maritime Board. The rates of pay for electrical engineers are as follows, per month:—

	First.	Second.	Third.	Fourth.
	£	£	£	£
Single-handed ships	20	—	—	—
Two-handed ships	21	18	—	—
Three-handed ships	22	18½	16½	—
Four-handed ships	23	18½	16½	16

E.T.U. Branch Treasurer Sentenced.—At Lancaster Assizes, on Friday, before Justice Baillache, Francis Furniss (37), electrician, pleaded guilty to several indictments for falsifications of accounts, forgery, and embezzlements of the books he held as treasurer of the Barrow branch of the Electrical Trades Union, between June, 1916, and June, 1918. For the defence, it was stated that Furniss had a 10 years' character as an excellent workman at Vickers's. He drew £4 5s. per week. He was sentenced to six months in the second division.

The Channel Tunnel.—Sir Arthur Fell, Chairman of the House of Commons Channel Tunnel Committee, has given notice of his intention to propose at an early date: "That in the opinion of this House the construction of the Channel Tunnel should be undertaken at the earliest moment after peace, to cement the friendship of the Allies in Western Europe, to improve their means of communication, and to promote their mutual commerce." Mr. Bonar Law will be asked to afford an early opportunity for discussion of the motion.

Metropolitan Association of Electric Tramways Managers.—A meeting of the members of this Association was held at the Municipal and County Club, 2, Whitehall Court, Whitehall, S.W., on Friday last, when there were present:—Messrs. Ullmann (East Ham), Hammond (Met. Electric), Harvey (Ilford), Murray (Walthamstow), Williams (Erith), Bruce (L.C.C.), Mason (South Met.), Mackinnon (London United), and Goodyer (Croydon). Messrs. Ullmann, Hammond, and Goodyer were re-elected chairman, vice-chairman, and hon. sec. respectively.

Electric Vehicle Progress.—Sheffield Corporation proposes contributing three guineas annually towards the expenses of the Electric Vehicle Committee of the Incorporated Municipal Electrical Association. The Port of London Authority is using an electric ambulance. Motor appliances are now used by the British Army to pump out trenches; this suggests similar work in commercial service in pumping out ditches and excavations where other forms of power are not readily available. The motor outfit is capable of pumping out 3,000 gallons per hour. The equipment comprises an Austin 2-ton truck with a separate 4½ × 6 four-cylinder motor of 32 rated H.P., mounted in a body and directly coupled to a compound-wound D.C. generator; three portable combination 200-volt electric motor and centrifugal pumps, and reels of cable by which the pumps may be set down in the trenches while the truck is some distance away. The pumps are specially designed to handle muddy water without clogging, and the wagon serves as a means of making the outfit mobile.—*Tramway and Railway World.*

Proposed Tunnel to Ireland.—On October 22nd, the Prime Minister was asked whether he could see his way to direct the Minister of Reconstruction to inquire into the possibility of constructing a tunnel to Ireland. In reply, Mr. Bonar Law stated that a Select Committee of the House of Commons had been appointed to consider the internal facilities for transport within the United Kingdom, and the inquiry suggested was covered by the terms of reference of that Committee.

Electric Pig-iron in Italy.—Electro-Metals, Ltd., of London, are putting up an extensive installation for the electric smelting of iron ore for Messrs. Ansaldo, in Italy, says *Indian Engineering*. In the first instance there are to be two plants of 4,000 H.P. each, and these will be followed by four more of the same size, bringing up the total to 20,000 H.P. The six plants together will be able to reduce 150,000 tons of ore annually. The electricity will be obtained from a three-phase, high-pressure supply through static transformers, three of which for each furnace will have a capacity of 1,200 K.V.A. each, and will be so arranged that the voltages on the secondaries can be varied between 35 and 70 volts in eight successive stages. The gas produced will escape through openings near the top of the shaft, and after being cleaned can be used for heating in the steel works. A portion of it, however, after being passed through a dust extractor and centrifugal washer, will be forced by a fan through tuyeres into the upper part of the furnace chamber.

The Metric System in Russia.—The Russian Government has decided to introduce the metric system of weights and measures. All businesses will be obliged to quote their prices according to both the old and the new systems, and the latter is to be introduced by August 21st, 1921. From January 1st, 1925, the use of the old system of weights and measures will be prohibited.

Nitrogen from the Air.—Referring to the possibility of obtaining nitrogen from the air in New Zealand, Mr. J. Orchiston, ex-chief telegraph engineer, at a meeting in Wellington, said the direct arc process, as carried on in Norway, was likely to be a success in New Zealand. In the Western Sounds of Otago there was abundance of water power waiting to be utilised, with the great advantage that Nature had so placed these powers that they could be cheaply harnessed alongside of first-class deep-water harbours. A syndicate was formed in Dunedin over a year ago for the purpose of promoting the manufacture of calcium nitrate and other electrochemical productions, but so far the Government had refused to grant the use of the water power asked for, although it was less than 1½ per cent. of the power going to waste in that region. —*Sydney Morning Herald.*

Fatality.—C. J. Ritson, aged 29, of Liverpool, died at the Liverpool Royal Infirmary, last week, as the result of being struck on the head by a falling trolley-head from a Corporation tramcar in London Road. A verdict of "Accidental death" was returned.

Lighting of Flats and Offices.—It has been brought to the notice of the Coal Mines Department by local fuel overseers that many occupiers of flats and offices appear to think that there is no need to send the usual application form to the local fuel overseer unless they use coal. To clear up the misunderstanding, it is stated that all consumers of more than 22,500 cb. ft. of gas or 120 B.T. units of electricity a year have to apply for an assessment, and the forms can be obtained from the gas or electricity undertakings if the consumer does not buy coal.

If the flat or office is part of a block where the heating is supplied by the landlord or main occupier, or if the gas or electricity is supplied by a sub-meter from the general supply to the building, the premises may be decided by the local fuel overseer to be a case for one joint assessment, and occupiers under these conditions should inquire from their landlords in the first instance.—*The Times.*

Inquiry.—The makers of I.C. switchgear with the trade mark of "W.V." in a circle are inquired for.

Electricity in Agriculture.—According to the *Evening News*, experiments which have been carried out in Dorset, to test the practical value of electrified seeds, have resulted in an unqualified verdict in their favour. Some thousands of acres were sown last autumn and spring with wheat, oats, and barley treated by the Wolfryn electrochemical process, which consists of soaking the seed in a weak solution of water and common salt, running a small electric current through the seeds while in soak, and then slowly drying them in a kiln.

Fields were divided into sections, and the electrically treated seeds and untreated seeds were sown under identical conditions as regards ploughing, manuring, and sowing, and on the same day. The difference between the two was most apparent in the early summer. Ear, straw, and tillering were greatly superior in the treated to the untreated. Threshing trials of crops inspected by our contemporary's agricultural correspondent this summer show results as follows :—

Mr. Lovelace's farm, Piddlehinton, Dorchester, a gain of seven bushels an acre on treated Benefactor wheat over untreated, and six bushels an acre on white oats.

Mr. Foot, Bincombe Farm, Dorchester, a gain of 6½ bushels per acre.

Mr. Cake, Higher Burton, Dorchester (Archer's stiff straw barley), a gain of 16 bushels per acre.

Mr. Legg, Blasherwell, Corfe Castle (white oats), a gain of 18 bushels per acre.

Messrs. S. & H. Smith, Rollington Farm, Corfe Castle, Dorset (white Abundance oats), a gain of 19 bushels per acre.

The wheat is calculated at 63 lb. per bushel, barley at 56, and oats at 42.

Appointments Vacant.—Draughtsman for the Battersea B.C. Electricity Department; senior assistant electrical engineers (74s. + 12½ per cent.) for the North-East Coast; resident electrical engineer, Rs. 700 per month, and shift engineer, Rs. 400 per month, for the Indian Ordnance Factories Committee. See our advertisement pages to-day.

Institution and Lecture Notes. — Electrical Power Engineers' Association.—Midland Division.—A North-Western Section, comprising Shropshire and Staffordshire, and a Birmingham Section, have now been formed in this Division. Hon. Sec., North-Western Section : Mr. T. Mason, 94, Gospel Oak Road, Ocker Hill, Tipton, Staffs. Birmingham Section : Mr. W. A. Kitchin, "Soho House," Soho Avenue, Handsworth, Birmingham.

The next smoking concert in connection with the Midland Division will be held at the White Horse Hotel, Congreve Street, Birmingham, on Wednesday, the 6th inst., the chair to be taken at 6.30 p.m.

Association of Mining Electrical Engineers.—The first meeting for the session of the West of Scotland Branch was held at Glasgow, on October 18th. Mr. A. Smellie, the new president, in the course of his presidential address, said the need for trained electrical engineers was greater than ever. The work of the future must be carried on by more economical methods, and he suggested the appointment of officials at all collieries where electric plant was used whose sole duty would be to inspect such plant and educate those entrusted with it.—*Glasgow Times.*

Institution of Electrical Engineers (South Midland Centre).—On Tuesday next, at 6 p.m., at Birmingham University, the new session opens with the delivery of the address by Mr. S. T. Allen, chairman. On Wednesday, November 27th, at 7 p.m., Mr. J. H. Shaw will read a paper on "High-Pressure and High-Temperature Steam in Large Power Stations."

Illuminating Engineering Society, U.S.A.—Included in the programme of the convention of the Society to be held on October 10th was the presentation of "War-Time Lighting Economies," a treatise prepared by the Committee on War Service, and submitted to the United States Fuel Administration to serve as the basis of the Fuel Administration's propaganda for economy in lighting on the part of the public at large. Copies of the paper may be obtained upon application to the general offices of the Society, 29 W. 39th Street, New York City.

The Electrical Association of Australia.—At a meeting of the Victorian Section on July 25th, a paper was read on "The Induction Generator," by Mr. F. E. Moreton, who said there were several instances in Australia of induction generators running in parallel with synchronous generators and supplying load, the magnetising current being supplied by the synchronous machinery. A case on record where the magnetising current was supplied by the circuit itself due to capacity was somewhat different.

It occurred to the author that the system might have been very nearly resonating, or at least have had a natural frequency somewhere near that of the generator, and that the induction generator would then force the oscillations in the circuit. To find whether this was the case, and to determine some of the characteristics of an induction generator, experiments were undertaken, of which details were given in the paper. The author concluded that the induction generator at present was not suitable for power stations.

"The Proper Use of Coal" was the subject of a lecture delivered at the Central Liberal Club, Dewsbury, on October 12th, by Mr. W. B. Woodhouse, general manager and chief engineer of the Yorkshire Electric Power Co. Referring to the B. of T. Report, he said that no doubt generation at large stations would effect a large saving, but there was a difference of opinion as to the necessity for a new body to carry out the work. The Leeds Corporation, for example, considered that it should do the work in conjunction with neighbours. Other municipalities in the West Riding took the same view, and working arrangements had already been made between Sheffield, Bradford, and Rotherham, and the Yorkshire Power Co.—*Yorks. Observer.*

E.T.U. Presentation.—At a concert organised by the Birmingham District and Coventry Branches of the Electrical Trades Union, a presentation was made to Mr. J. Kinniburgh (national organiser). Mr. T. Gaynor occupied the chair, and Mr. J. W. Ball (general president), in making the presentation, referred to the progress of the Union in the Birmingham district, which was due, in a large measure, to the genius of Mr. Kinniburgh, to whom he handed a gold watch and chain for himself and a gold wristlet watch for his wife.

Women Sub-Station Operators.—The war has brought many changes in central-station practice, but few of these are more significant than the use of women as sub-station operators on the system of the Edison Electric Illuminating Co., of Boston, Mass. According to the *Electrical World* of September 21st, while as yet there are engaged only about 30 women in this work, there is every prospect that the number will be extended. Two sub-stations are now operated exclusively by women, and the results appear to be admirable in every way. The service appears to be fully as reliable as though men were in charge, emergencies have been met, and the effect upon the health of the operators has been uniformly good. The company distributes energy over an area of 700 sq. miles, and for this reason the sub-station service is of great importance. The Roslindale sub-station supplies energy for power, and commercial and street lighting, and has a rating of 3,790 kw. at 13,800 to 2,300 volts.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Darwen Corporation received 94 applications for the position of electrical engineer, and these stand referred to a sub-committee.

Mr. W. Y. Anderson, A.M.I.E.E., has been appointed commercial engineer of the City of Birmingham Electric Supply Department.

Mr. J. F. Croft, works manager of the gasworks at Fenton, has been appointed manager and secretary of the Stone Gas & Electricity Co., in succession to Mr. T. W. Saville.

The Aberdeen Electricity Committee has increased the salary of Mr. Downie, chief clerk to the department, to £300, including war bonus.

Mr. D. Cowan, station superintendent at the Croydon municipal electricity works, who is retiring, has been presented by the staff and employés with a gold ring and pendant, and with a gold-mounted umbrella for his wife.

Mr. S. F. Blyth, station superintendent at the Great Yarmouth electricity works, in recognition of over 20 years' service to the undertaking, has been presented by the staff with a silver cigarette case and a vacuum flask.

Much sympathy has been expressed with Mr. J. B. Patterson, acting electrical engineer for the Lancaster Corporation, who has lost his wife and a son, aged 11 years, within two days from pneumonia following influenza.

Mr. J. W. Papworth, who for the past 11 years has held the post of burgh electrical engineer to the Stirling (N.B.) Corporation, has resigned, having accepted an appointment in the South.

General.—Sir Wm. Plender has been appointed honorary financial adviser to the Board of Trade.

It is announced that three Labour representatives, Messrs. Harry Gosling, L. W. Ogden, and James Gavin, have been appointed members of a Provisional Council to advise the Department of Commerce and Industry set up by the Board of Trade.

Major R. Grierson, R.E., who has now been moved to the H.Q., Lines of Communication, France, to do duty as Staff Officer for Electrical and Mechanical Services to the Deputy-Directory of Works (South and Central), and also to command the 356th Electrical and Mechanical Company, has suffered from a shortage of technical labour, so he is forming a school of instruction for electricians and engine drivers. He enlisted in August, 1914, as a private, and saw active service in Gallipoli, being "mentioned in dispatches" and promoted to captain.

Roll of Honour.—The Military Medal has been awarded to Inspector Norcombe and to Motorman Stevens, of the Exeter tramway staff.

Sergeant C. Self, R.E., who was with Messrs. Crompton and Co., Ltd., Chelmsford, is reported missing from the ss. *Leinster*, sunk by a submarine.

Pte. J. W. Powell, Sherwood Foresters, who has died of pneumonia while under treatment for wounds, was an electrical engineer with the Mansfield Engineering Co.

Sergeant C. N. Smith, Devonshire Regiment, who has been killed by a shell, enlisted from the Barnstaple Corporation electric light works at the outbreak of war.

Corporal G. Blackshaw, Royal Scots, killed in action, was formerly employed by Messrs. Baxendale & Co., Ltd., Manchester.

Gunner B. P. Jenkins, Westminster Dragoons, wounded whilst serving in Palestine, was an apprentice with Messrs. Dick, Kerr & Co., Ltd., Preston.

Piper J. Richardson, of the Manitoba Regiment, one of the new V.C.'s, began his apprenticeship in 1911 as an electrical engineer with the General Electric Co. at Glasgow, and remained with them till he went to Canada with his parents.

Corporal C. R. Edwards, A.S.C., M.T., who has died of pneumonia in France, aged 24, was employed in the electrical repairs department of the Burnley Corporation tramways.

Signaller H. Pennington, King's Liverpool Regiment, who has been wounded, was employed at the Howe Bridge power station.

Trooper T. Taylor, Lancashire Hussars, killed in action, was employed by B.I. & Helsby Cables, Ltd., Prescot.

Lieutenant H. Walker, R.F.A., previously missing, now reported killed, was employed by the British Westinghouse Co., at Trafford Park.

Private G. Wade, Manchester Regiment, who has died of wounds, was with Messrs. Charles Macintosh & Co., Ltd., Manchester.

Sergeant J. Williams, Lancashire Fusiliers, awarded the Military Medal, was employed by the British Westinghouse Co., Ltd., Trafford Park.

Private H. Bentley, Highland L.I., of Great Haywood, Staffs, who was in the accountant's department at Messrs. Siemens Bros., Ltd., Stafford, has been killed in action.

Private W. G. Earrey, East Surrey Yeomanry, lost by the sinking of the ss. *Leinster*, was on the electrical staff at Chatham Dockyard.

Captain R. B. Broster, West Riding Regiment, previously reported missing, now reported killed, was at the outbreak of the war studying electrical engineering at the Keighley Corporation generating station.

Private W. J. Hurford, Bedfordshire Regiment, killed in action, was employed by the Bristol Corporation electricity department.

At the last Barrow Town Council meeting, the Mayor moved that a vote of condolence be entered upon the minutes, and a copy sent to Ald. J. P. Smith, J.P., Chairman of the Electricity Committee, and a former Mayor of the borough, whose son, Lieutenant Basil Smith, South Lancashire Regiment, had met his death in action. Lieutenant Smith was training as an electrical engineer when he joined the Colours. He fell whilst leading his platoon in Salonica.

Obituary.—Mr. J. O. Callender.—Mr. James Ormiston Callender, whose death it was our regretful duty to announce last week, was the fourth son of the late Mr. W. O. Callender, of Bournemouth. He was born in 1863, in London, but, both by education and by family ties, he was a true Scotsman, and so remained till the close of his life. He was educated at the Glasgow Academy and in Paris, and received his technical training at the City & Guilds of London Institute, South Kensington. On its completion he joined the testing staff of the Callender's Telegraph & Bitumen Co., at Erith, and was in charge of that department for some years. During that period he made several journeys to France and Italy, returning to this country in 1886 with impaired health, which necessitated a lengthy voyage to South Africa. On his return, in 1886, he decided, under medical advice, to proceed to New Zealand, where he resided for some time at Queenstown, whose climate proved very beneficial, with the result that in the following year he took up business as a consulting engineer in Sydney, where he was one of the pioneers in the electrical industry, and a founder, and early president, of the Institution of the Electrical Engineers in that continent. During the 14 years in which he was residing in Australia he made many voyages, visiting all parts of the Australian Continent, and also China, Japan, and the United States, besides coming home on several occasions. During that time he represented the Callender Co.'s interests in Australia, and, in addition to his own consulting work, carried out several important contracts for the home firm. In 1900, the Callender's Cable & Construction Co. having been formed, and its business so largely increased, he returned to take a post at headquarters, and spent the rest of his life as one of the management of the company in London. Owing to his extensive experience of the world, he had charge of the overseas department of the company, as well as the general management of the extensive contracts which were carried out at home. In 1903 the Callender Co. acquired control of the Anchor Cable Works at Leigh, Lancashire, and from the very beginning of that connection Mr. James Callender took the keenest interest in the progress of the Anchor Works, which were entirely reorganised under his direction, and which under his personal supervision developed into one of the most important factories dealing with rubber insulation in the country. The Picardy Works, recently constructed for the manufacture of war material, was designed under his personal care and supervision. For several years past he has suffered from indifferent health. In July, 1914, he was in Carlsbad, and only reached Switzerland a few days before the declaration of war. As he was still an invalid, he suffered much during the difficult journey home in August of that year, but he regained his strength, and was most active in his work until a few months ago, when he had a breakdown which necessitated his taking a lengthy rest. His recovery was, however, anticipated by his friends, but a sudden relapse, after an operation, took place on October 18th, and he passed away in his sleep the following day at Swanage. He was an Associate of the Institution of Electrical Engineers, and a Member of Council, and represented his company on the Committee of the B.E.A.M.A.

The memory of Mr. James O. Callender will always be revered at the Anchor Works, Leigh, in the development and success of which he took quite a fatherly pride. At the hour of his funeral, last Tuesday, the works closed down for half an hour, when 900 of the workpeople and staff attended a memorial service in the works canteen, conducted by the Rev. L. S. Murdock, Vicar of the parish in which the works are situated. The service opened with the time-honoured hymn "O God, our help in ages past," followed by prayer. A second hymn, "Rock of Ages," was sung, after which a brief address was given by the Vicar, in which he referred to the personal influence the late Mr. Callender had exerted on all with whom he came in contact. Those who were present when the canteen was opened two years ago, he said, would remember the almost boyish joyfulness of Mr. Callender's demeanour on that day, when he seemed to be quite one of them. Interested as he was in all those who had taken up arms for our country, and in those from the Anchor Works who had given their lives in the great cause, he looked forward to a happier gathering when Peace was proclaimed. They at Leigh felt his loss very deeply, and mourned with those who were near and dear to him. The service was impressive. The singing was led by the Anchor Musical Society. Mr. J. Bowyer, works manager, represented the Anchor Works at the funeral. Two large wreaths, one taking the appropriate form of an anchor, were sent by the workpeople and staff.

Mr. G. Corfield.—The death occurred on October 19th of Mr. George Corfield (of Corfield & Cripwell, Balfour House, E.C.) in his 51st year.

Mr. G. V. Laycock.—Mr. Guy V. Laycock, an electrical engineer, who was in business at Huddersfield for six years, passed away on October 25th at a nursing home, aged 36 years.

Mr. M. E. Curwen.—Mr. Maskell E. Curwen, European manager of the J. G. Brill Co., died suddenly at Philadelphia on October 1st.

Mr. F. W. Heaton.—We regret to record the death of Mr. F. W. Heaton, of Manchester, in his 52nd year. Mr. Heaton, who was well known in both the electrical and the mechanical engineering industries, was managing director of Messrs. Heaton & Smith, Ltd., Salford Switch Works, Salford, and later of Heaton & Co. He was the pioneer of many present-day electrical specialities.

Mr. E. J. Docker.—Mr. E. J. Docker, head storekeeper of Messrs. Drake & Gorham, Ltd., Long Acre, W.C. 2, died from influenza and pneumonia on October 22nd at the age of 35 years.

Mr. E. Bennis.—We regret to record that Mr. Edward Bennis, founder of the well-known firm of E. Bennis & Co., has passed away at the age of 81 years.

Will.—The late Col. F. J. G. Murray, a director of the Calcutta Electric Supply Corporation, Ltd., left £902,333 gross, and £894,195 net personalty.

NEW COMPANIES REGISTERED.

Howard, Rawson & Co., Ltd. (151,759).—Private company. Registered October 24th. Capital, £5,000 in £1 shares (500 deferred). To take over the business of scientific glass-blowers carried on by Howard Rawson & Co. at 21b, Pond Place, S.W. 3, and to carry on the business of manufacturers of all kinds of glassware, apparatus, and appliances, &c. The subscribers (each with one share) are:—G. Howard Baker, 73, Heythrop Street, Southfields, S.W., scientific glass manufacturer; W. Pearce, 5, Delvino Road, Parsons Green, S.W., scientific glass manufacturer; J. S. Allen, 52, Clarendon Road, Lewisham, paper merchant; T. P. Parkes, 114, Wickham Road, S.W. 4, laboratory furnisher. The first directors are to be appointed by the subscribers. Registered office: 10, Bush Lane, E.C. 4.

British Steel Corporation, Ltd. (151,781).—Private company. Registered October 26th. Capital, £1,000,000 in £1 shares. To carry on the business of iron smelters, engineers, metallurgists, manufacturers of and dealers in iron and steel in all their branches, of castings, bars, blooms, billets, plates, sheets, and any other form, and of any product of iron and steel in combination with any other metal, coaters of any of the above by galvanising or otherwise with zinc, tin, lead, or any other metals or alloys, colliery proprietors, tinplate merchants, agents, brokers, miners, &c. The subscribers (each with one share) are:—R. V. Vassar-Smith, Charlton Park, Charlton Kings, Glos., banker; J. C. Davies, The Mount, Gowerton, Glam., ironmaster; J. R. Wright, Hendrefoilan, Sketty, Glam., ironmaster; R. Tilden Smith, 13, Upper Brook Street, London, colliery proprietor. All directors must be British subjects, and other provisions, in form approved by the Board of Trade, are inserted in the Articles with a view to excluding foreign control. Registered office: 70, Lombard Street, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

George W. Green & Co., Ltd.—Debenture dated October 8th, 1918, charged on the company's undertaking and property, present and future, including uncalled capital, securing £300. Holder: G. W. Green, 12, Mortlake Road, Kew.

Rees-Roturbo Manufacturing Co., Ltd.—Satisfaction in full on October 1st, 1918, of debentures dated June 1st, 1916, securing £185,000, £100,000, and £17,000 respectively.

CITY NOTES.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

At the annual meeting, Sir J. Denison-Pender, K.C.M.G., said that the gross receipts for 1917 were £1,508,000, an increase of £287,000, due to the greatly increased traffic all over the system. The working and other expenses amounted to £552,000, an increase of £122,000, showing an increased net revenue of £165,000 for 1917. The company's holding in War Loan and National War Bonds amounts to a total of £1,668,000. The 20 years' concession granted to the company by the Spanish Government in 1897 for providing and maintaining under a subsidy arrangement, cable communication between Manila and the islands of Iloilo and Cebu (Visayas), expired in November last, when the company's stations in those islands were closed. The reason for this action was that the United States, having taken over the Philippines from Spain after the war between the two countries, soon after the concession was granted, and having subsequently laid a network of Government cables between the principal islands, considered the renewal of the concessionary arrangement unnecessary. The company's cables between Iloilo, Cebu, and Manila had since been picked up for utilisation elsewhere, after being renewed at the company's cable depot at Singapore. The company's traffic greatly expanded in the early days of the war through the Government restriction of coding facilities, and later on, when the postal delays caused by the withdrawal of shipping for war purposes made cabling more necessary than ever, an additional strain was placed upon the cables, which was accentuated by the troubles in Russia preventing the Great Northern Co. from carrying—as in pre-war days—their share of the China and Japan traffic. Nevertheless, their staff had successfully coped with this extra work, although heavy delays were unavoidable. When the war was over he might be able to go more closely into some details which would be of the greatest interest.

Replying to questions, the chairman said that he was not going to prophesy about wireless telegraphy or what it would do. He had seen the report that a message sent by cable as well as by the wireless was delivered more quickly by the wireless. It was very easy for the wireless system to send messages with an absolutely free hand, because they were cabling no traffic. The cable companies would be very glad —at least, at the present time—if the wireless system would come in and relieve them of some of their traffic. That would be a great boon to the public, both as regards commercial and private messages. The past year had been a good one, but he would like to see some reduction in delays. The companies had not raised a single cable rate. The revenue had been made under the old rate, and that was saying a good deal, because many of the Governments, both at home and in other countries, had increased their rates very materially.

Eastern Telegraph Co., Ltd.

Presiding at the annual meeting, on October 23rd, Sir John Denison-Pender said that the total revenue was £2,901,579, which is £382,296 more than the previous highest record, attained in 1916. The total working expenses were £1,262,316, or £202,373 more than for last year. The amount payable for income tax and excess profits duty was £659,581, an increase of £213,292. They were able to make the same contribution to the general reserve fund as in 1916, viz., £500,000, while maintaining the payment of a dividend and bonus on the ordinary stock at 8 per cent., free of income tax. Payments to staff and other expenses in connection with the war were £170,744, an increase of £92,310. A still further increase has taken place during the present year. The work of their staff, both at home and abroad, on land and on sea, throughout the war had been of a most strenuous nature, and they had been called upon to work long hours, sometimes under circumstances of discomfort and danger; but they had always responded with cheerfulness to the demands of the Government, with a full knowledge of the vital importance of the service due to the Empire and to the Allies.

The general reserve fund now amounted to over 2½ millions. The fund was principally required to meet the cost of renewals of cables and for additional sections to meet the ever-growing demands for extra capacity to deal with the increasing volume of traffic. They had expended for this purpose during the 17 years prior to the war on an average nearly £300,000 per annum. Although they had incurred considerable expenditure on account of repairs to cables since the war started, the conditions had been such as to prevent the carrying out of renewals or the laying of new commercial sections. At times it seemed almost impossible to get through the work, but so far they had been able to maintain satisfactory Government service; but it was not surprising if on occasions considerable delay took place in the receipt, transmission, and delivery of commercial correspondence. As soon as normal conditions again prevailed they must be prepared to incur heavy expenditure and at once proceed with the work which had been suspended during the last four years, in spite of the greatly increased cost of cable which would continue for some time. Therefore, this general reserve fund should be built up as much as possible to meet the very heavy withdrawals which must take place, they hoped, in the near future. The growth of the various companies and the increase in the work necessitated the appointment of some one to assist in the administrative work of the Eastern Co. The conditions arising from the war had naturally brought them into close touch with Government departments. The maintenance of their system and the safety of their ships had been the special care of the Admiralty, and in the course of their relations with that department he had many opportunities of realising the particular qualifications of Capt. H. W. Grant, who, when war broke out and for some time after, was in command of H.M.S. *Hampshire* in Eastern waters and the Grand Fleet, but who was ultimately called to the Admiralty War Staff at Whitehall, where for some two or three years he (the speaker) was in almost daily communication with him, with the result that in December last the board applied to the Admiralty for permission to offer this gentleman a position of managing director. Their lordships, appreciating the benefit which would be bound to result both to the Naval service and the Eastern Telegraph Co. by the latter obtaining the services of Capt. Grant, released him as soon as he could be spared from the important duties on which he was engaged, and they elected Capt. Grant a managing director in March last. The condition of affairs set up by the war was wholly unprecedented. The demands of the State for the prompt treatment of its telegrams were at times almost overwhelming, but its interests must be the first consideration. The claims of the general public through the medium of the Press during these stirring times also imposed upon them an additional burden. The formalities of censorship must affect the prompt dispatch of Press and commercial telegrams to a considerable extent. These adverse conditions, together with the difficulties of maintaining their cables, seriously reduced the promptitude of a service which in normal times was proverbial for speed and accuracy. They were doing everything that was humanly possible to carry the exceptional traffic thrown on their system through war conditions, which included the interruption of two very important systems to the East, viz., the total closing down of the Indo-European line through Germany and Russia to India, and the interruption of the Great Northern system through Russia to China and Japan. In pre-war times those two companies, although in no way under their working control and not included in the cable association under that roof, worked with them in such a manner that, when one of them foresaw delay owing to a partial temporary interruption of its service, it handed traffic over to one or both of the others if they happened to be in a more fortunate position at the time, thus ensuring regular and speedy transmission in the interests of the telegraphing public. The chairman said that the problems which would confront them on the conclusion of peace would demand a great deal of energy and concentration on the part of the whole of the staff.

Erinoid, Ltd.

Mr. A. Binnie presiding at the annual meeting said, in spite of the continual rise in cost of manufacture, the profits for the year, £34,000, showed an increase of £14,000. The industry was a new one, and a key industry upon which many other industries depended for raw material. The sales in the last six months were 35 per cent. greater than for the first six. Their only anxiety was the constant rise in the cost of raw material and working expenses. Their reserve at August 31st was nearly 50 per cent. of the share capital at that date. This had been achieved in three years. There was at present nothing to prevent a renewal of unfair competition from abroad after the war. They heard of various reconstruction programmes for preventing unemployment. A business programme would encourage new industries employing skilled labour and light labour at home instead of abroad. New industries set up here now had to face a form of taxation which, while the war lasted rendered sound finance impossible, and there was no promise of protection from unfair competition afterwards. That programme would not attract inventive ability or retain it here. If we did not regulate imports, imports would regulate the conditions of production here to the detriment of both capital and labour. A dividend of 10d. per share (16⅔ per cent.), free of tax, was declared.

Claud Hamilton, Ltd.—According to the "Financial Times," a dividend of 7½ per cent., and a bonus of 5 per cent., on the ordinary shares are to be paid, after providing for depreciation and writing £1,000 off investments. £9,448 is carried forward.

International Light & Power Co., Ltd.—Dividend of 3 per cent., less British income tax,, on the preference shares, for six months, on account of accrued arrears.—*Financial Times.*

Bruce Peebles & Co., Ltd.—Interim dividend at the rate of 7½ per cent. per annum on the preference shares for the half-year ended June.

Trafford Park Estates, Ltd.—Dividend 6 per cent.; carry forward £58,227.

Calcutta Electric Supply Corporation, Ltd.—Interim dividend at the rate of 7 per cent. per annum (3s. 6d. per share), less income tax, on the ordinary shares for the half-year.

Calcutta Tramways Co., Ltd.—Interim dividend of 2½ per cent., free of income tax, on the ordinary shares.

Babcock & Wilcox, Ltd.—Interim dividend of 6 per cent., free of tax.

Westinghouse Brake Co.—Interim dividend of 5 per cent., less tax, on the ordinary shares.

Anderson Foundry Co., Ltd.—Interim dividend 4s. 6d. per share.

Parsons Marine Steam Turbine Co., Ltd.—A final dividend of 15 per cent. is recommended, making 25 per cent. for the year, free of tax.

British Columbia Electric Railway Co., Ltd.—Five per cent. on the cumulative perpetual preference stock.

STOCKS AND SHARES.

TUESDAY EVENING.

MARKETS in the Stock Exchange remain good, the military and diplomatic developments causing great satisfaction, and encouraging a general atmosphere of buoyancy. Attention is keenly directed to after-the-war possibilities. A falling-off in subscriptions to National War Bonds is due to the expectation that the war may be over by Christmas-time. Electric lighting shares are much in favour amongst those who used to support them in days bygone. Home Railway stocks have brisked up considerably.

Marconis have been again on the rise. The parent shares went over 5, and the preference gained 7s. 6d. at 4¼. Americans advanced smartly to 33s. 6d., but Marconi Marines and Canadians follow slowly, the respective prices being 3 15/32 and 14s. 6d. respectively.

Other members of the cable group are mostly holding their prices, without much change in the quotations. Eastern Extensions and Western Telegraphs have lost ¼ apiece. Globe preference are an equal amount to the good. Orientals have run up to 3¼, showing a gain of 3s. 9d.

While the Home Railway steam stocks are advancing, the Underground list is rather dull. The income bonds have eased off, and Metropolitans are heavy. 'Bus "A" shares are more buoyant, however, like most other more or less speculative issues round the markets. Anything which promises a "run for the money" is assured of a following in these pre-peace days.

County of London Electric ordinary have risen to 11½, which is fully 25s. higher than they stood a fortnight ago. The preference have advanced £10. London Electrics are slightly harder at 1 5/16. Charing Cross, with ¼ rise, are more satisfactorily sold than bought, and the shares in the West End companies are decidedly strong. Notting Hill preference rose ¼ to 8¾. The principal gain has been secured by Citys, which are 10s. up at 13¼. While there are no quotable changes in the other shares, prices actually are better than they look, and in some cases can be sold well above the middle quotations. The manufacturing group is quiet, and the recent activity has died down to some extent in such shares as Edisons and those which were eagerly purchased at the beginning of October. At the same time, there has been no set-back this week, the market being firm throughout.

Amongst the foreign descriptions, the principal advances since we last wrote are shown by British Columbia electric issues. The preferred, which was rather left behind in the previous improvement, has put on 3 points, and the deferred is similarly higher. The 4½ per cent. debenture is again a point up, and the preference 1½. The Anglo-Argentine Tramways are also strong, the first and second preference gaining ¼ and ½ respectively. For the 5 per cent. debenture stock, there are only buyers at the moment. There are some who contrast the last-named stock with Mexican Light & Power first debentures, which stand only 4 points lower than the Anglo-Argentine Tramways stock, and they argue that the latter is the cheaper, having regard to the nature of the security of both.

Mexicans as a whole are inclined to mark time after their recent jumps. Mexican Light common and preferred are both a dollar up, but the Tramways Bonds show no change. Mexico Tramway common shares have risen to 37; Monterey Fives are harder at 54½. Brazilian Tractions reacted 1 after their swift advance. A little attention is being paid again to Rio Tramway bonds, the first hardening to 90 and the second to 80. The fact of the first mortgage bonds being repayable in 1935, 17 years hence, adds attraction to the investment, because, so far as can be seen, there is little doubt as to their being repaid at due date. The San Paulo 5 per cent. debentures, now about 92, are due for redemption in 1929, which is the reason for their standing higher than the company's 5 per cent. perpetual consolidated debenture stock, quoted at 79.

London & Suburban Tractions, after dipping to half-a-crown, recovered to 3s. 6d., and the 5 per cent. cumulative preference have changed hands this week at 8s. 7½d. British Electric Traction ordinary at 45½, and the 6 per cent. participating preference at 79, are neglected, but the 5 per cent. perpetual debenture stock was bought the other day at 83½. The 4½ per cent. debenture stock last changed hands at 65½ about a month ago. The rubber share market holds its prices, and business is fairly active, though patchy. The firmer tendency in armament shares is again noticeable, while there is also a disposition towards recovery in the iron and steel list.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1916.	Dividend 1917.	Price Oct. 29, 1918.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	9	10	6¾	—	£7 17 0
Charing Cross Ordinary	5	4	2¾	+ ¼	5 18 6
do. do. do. 4½ Pref.	4½	4½	2¼	—	6 18 6
Chelsea	3	5	3⅛	—	7 16 10
City of London	8	8	13½	+ ½	6 0 6
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	11½	+ ¼	6 4 3
do. do. 6 per cent. Pref.	6	6	10	+ ¼	6 0 0
Kensington Ordinary	6	7	6¾	—	6 17 7
London Electric	Nil	Nil	1¾	—	Nil
do. do. 6 per cent. Pref.	4	5	3¾	—	7 2 10
Metropolitan	3	4	3⅛	—	6 10 7
do. 4½ per cent. Pref.	4½	4½	2½	—	6 18 6
St. James' and Pall Mall	8	9	6¾	—	6 13 4
South London	5	5	3	—	6 13 4
South Metropolitan Pref.	7	7	20/6	—	6 16 7
Westminster Ordinary	7	9	6¼	—	6 13 6
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	100	—	6 0 0
do. Def.	1½	1½	23⅜	—	6 8 6
Chile Telephone	8	8	7½	—	5 6 8
Cuba Sub. Ord.	7	7	10½	—	*6 13 4
Eastern Extension	8	8	16	— ¼	*5 0 0
Eastern Tel. Ord.	8	8	16¼	—	*4 19 1
Globe Tel. and T. Ord.	7	7	14½	—	*4 16 5
do. do. Pref.	6	6	10½	+ ¼	5 14 3
Great Northern Tel.	24	22	84	—1	6 9 5
Indo-European	13	13	58½	—	5 12 0
Marconi	15	20	5	+ ¼	4 0 0
Oriental Telephone Ord.	10	10	3¼	— 1/16	2 17 2
United R. Plate Tel.	8	8	7¾	—	*5 3 3
West India and Panama	6d.	1/3	1⅞	—	*3 11 6
Western Telegraph	8	8	17	— ¼	*4 14 2
HOME RAILS.					
Central London Ord. Assented	4	4	63½	+1	6 6 0
Metropolitan	—	1	27	—	3 14 0
do. District	Nil	Nil	26	—	Nil
Underground Electric Ordinary	Nil	Nil	2⅞	—	Nil
do. do. "A"	Nil	Nil	7/8	+6d.	Nil
do. do. Income	6	4	87½	— ½	*4 11 5
FOREIGN TRAMS, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4¾	—	6 6 4
Anglo-Arg. Trams. First Pref.	5½	5½	3⅞	+ ½	—
do. do. 2nd Pref.	5¼	—	3⅜	+ ¼	—
do. do. 5 Deb.	5	5	75	—	6 13 4
Brazil Tractions	—	—	56½	—1½	—
Bombay Electric Pref.	6	6	10⅜	—	5 11 7
British Columbia Elec. Rly. Pfcs.	5	5	63	+1½	7 18 8
do. do. Preferred	Nil	Nil	45½	+3	Nil
do. do. Deferred	Nil	Nil	44½	+3	Nil
do. do. Deb.	4½	4½	61½	+1	6 18 3
Mexico Trams 5 per cent. Bonds	Nil	Nil	64	—	Nil
do. 6 per cent. Bonds	Nil	Nil	50	—	Nil
Mexican Light Common	Nil	Nil	37½	+1	Nil
do. Pref.	Nil	Nil	50	+1	Nil
do. 1st Bonds	Nil	Nil	71	+1	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	93	+ ½	4 0 0
British Aluminium Ord.	10	10	11⅛	—6d.	5 10 4
British Insulated Ord.	20	20	24	—	4 9 0
British Westinghouse Pref.	7½	7½	9⅜	—	6 0 0
Callenders	20	25	10	—	6 5 0
do. 5 Pref.	5	5	5½	—	—
Castner-Kellner	22	20	81½	—	5 8 4
Edison-Swan, "A"	—	—	5	—	Nil
do. do. 4 per cent. Deb.	4	4	75	—	5 6 0
Electric Construction	7½	10	14	—	7 5 6
Gen. Elec. Pref.	6	6	100	—	6 2 4
do. Ord.	10	10	18	—	*5 11 1
Henley	25	25	34	—	5 11 2
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	17½	—	*5 14 3
Telegraph Con.	20	20	49	—	*4 18 0

*Dividends paid free of Income Tax.

AN ELECTRIC WORLD GIRDLE.

By EDWARD RAYMOND-BARKER.

(*Concluded from page* 390.)

Mr. Preece says "such a cable would be capable of transmitting at the rate of 100 words per minute, working *duplex*," *i.e.*, 50 W.P.M. each way. As this is well above the fastest manual speed possible, it follows that *all* the sections are intended to be worked by *automatic* transmission; yet, when speaking of the capital outlay of £7,000,000 required for a complete new ring, he says:—"But as there is no apparent reason why the Pacific cable should not form a section of the ring the actual expenditure should not exceed £5,000,000," &c. If, however, this were to be done how could the universal working speed each way throughout the cable girdle be 50 W.P.M., seeing that on *duplex connections* the maximum working speed on the Vancouver—Fanning cable under present conditions cannot well exceed 17 to 18 five-letter words per minute, or, say, 85 to 90 letters per minute; and this with curbed automatic sending, and with a well-known form of current amplifier receiver with siphon recorder on a local circuit. On *simplex connections* the working speed is about 105 letters, or 21 W.P.M. How then can the speed of 50 W.P.M.

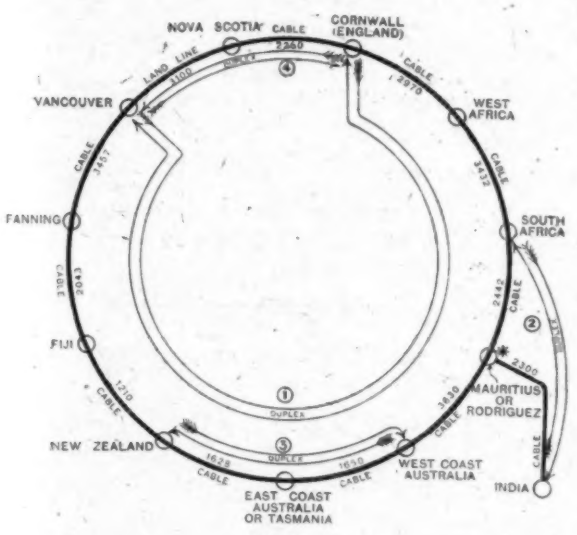

FIG. 1.

be maintained if the maximum duplex working each way on the existing Pacific cable part of the ring is no higher than 17 or 18 W.P.M.?

Mr. Preece says: "A separate cable would connect India with Mauritius," &c., which either means that it forms a permanent T-piece to the cable ring or that when India should come in it is switched on to one half, or on to the other side, of the girdle at the Mauritius station, by a special arrangement, which can scarcely be what is intended; and yet, as it is a *single* cable to India, it cannot, like the other stations, form part of the ring. Under these circumstances, how can India (according to the programme) communicate by duplex with Australia and also at the same time in the reverse direction with S. Africa? Is this a case of double duplex? If the ring system is worked on ordinary cable duplex, the duplicated duplex here inferred would be impossible. But perhaps the advocate of this world-girdle cable scheme contemplates that in cases where his T-piece cable to India is called upon to do duty in two duplex systems simultaneously, sudden transition is to be effected by some such electrical solution of the difficulty as might be found in Heurtley's diplex cable-telegraph system, duplexed, or in the cable quadruplex system of E.C.R. Marks. Here, indeed, is a case where an ordinarily-intelligent reader of the *Times* Special Supplement might reasonably object to airy generalities, and ask for more explicit statements as to the practical working conditions involved in this cable girdle. In the absence of any such illuminating explanation, the writer must conclude that Mr. Preece's complicated working routine will not in this respect, at least, fulfil his expectation.

When it is remembered that the length of the existing Vancouver-Fanning cable is 3,458 nautical miles, and that with a conductor of 600 lb. and insulation weighing 340 lb. per nautical mile, the speed of working through it is only 17 or 18 W.P.M., it will be evident that, under the usual conditions of signalling, the sections having anything like this length would require a *core* of extraordinarily large size to give 50 W.P.M. each way.

Mr. Preece does not stop to tell us whether the working of 50 W.P.M. each way is to be obtained through his long cables by specially heavy cores in conjunction with the customary siphon-recorder, or whether through cores of (say) the Vancouver-Fanning size by the use of even more extraordinarily sensitive current-amplifiers than the Heurtley hot wire, the Orling jet, or the Dixon selenium amplifier. But if we treat this very important consideration as a detail we are confronted with the not easily conceded demand on our imagination that when, for instance, Routine (1) is in progress, and Cornwall and Vancouver for 3½ hours are exchanging their respective 10,000 words in opposite directions through the literally world-wide ring of cables *viâ* Africa, Australia, and New Zealand—what time also Cornwall and Nova Scotia are composedly negotiating the exchange of *private messages* over the more direct line connecting them—all the intermediate stations round the ring are busy with English and Canadian Press news. It is only a cable telegraphist who can fully realise the difficulties introduced by the relaying work at each station in dealing with Cornwall's and Vancouver's Press news through the ring; and this is only one Routine that we are considering out of the many.

Which ever form of relaying be adopted—automatic translation, auto-tape-perforation and retransmission, or auto-retransmission, whether with Brown's drum, Muirhead's vibrating gold wire, or the "Dipper" cable relay—the amount of mental high tension in the negotiation of England's and Canada's exchange of Press news would, even if practicable, well-nigh reach snapping point, especially if delicate amplifiers be used. Was all this taken into account when Routine (1) was proposed? After many years' experience in the routine working at important cable stations, the writer is forced to the conclusion that Mr. Preece's complex cable girdle scheme and suggested routine working—with so many variations in the conditions of working throughout the 24 hours—would be impracticable. For just try to realise what is involved in the 3½ hours' *duplex* exchange of Press news between, say, Cornwall and Canada at 50 W.P.M. each way through eight translating stations, amplifiers, and automatic relays, all at concert pitch; or automatic perforators taking part, or human perforators (one hopes these will not be on the West Coast of Africa) joining in the world-wide worry over England's and Canada's Press news! A striking instance of newspaper submarine telegraphy *in excelsis*—or, rather, *in infernis*, the staffs of Mr. Preece's stations might reasonably call it.

These cables designed, constructed, laid, staffed, and maintained at the cost of the British and Dominion Governments are—so it appears—to compete at extremely low rates with the present cable systems which have been built up by private and public enterprise, and as the result of most costly individual research and labour, along the difficult road of dearly-purchased experience—experience from which the said Governments are to derive full benefit gratis.

Pros and cons regarding this debatable matter need not here exercise us; but it is only fair to the existing cable companies to call your readers' attention to the extra facilities already accorded by them—for the last six years or more—to the cabling public.

One instance of this found in the present Atlantic cable charges between Great Britain and N. America—viz., a system of deferred day-cable plain-language letters has been introduced, in which the said cable letters give precedence to the more pressing commercial *code*, or full rates, traffic,

but are delivered after incurring some slight delay compared with next-to-*nil* delay to which *flash*, or instantaneous, service (*e.g.*, Stock Exchange traffic) is subjected. Charges for the said day-cable plain-language letters are, we understand, at the rate of 6s. for a minimum number of 20 words (or about 3½d. per word), with a charge of 1s. 3d. for every additional five words—*i.e.*, 3d. per word.

Then also there are week-end-cable plain-language letters—minimum, 30 words for 6s.; *i.e.*, 2½d. per word, with 1s. chargeable for every additional five words or less, *i.e.*, under 2½d. per word.

Again, there are deferred Press messages, for which a charge is made of 2½d. per word. Similar systems are worked in other cable companies. The writer has himself been the recipient of a week-end cable letter handed in by a soldier-son in Arabia, received over the Eastern Co.'s cables and telegraphically recorded, in Roman type, in London the same day, and delivered by post in Gloucestershire the following morning—cost, 6½d. per word.

As this question of cost per word bears directly on the low rates per word suggested by Mr. Preece for the cable girdle, it may be of interest to mention here that in the case of trans-Atlantic traffic the reduced rates referred to above are made possible by the fact that owing to the difference in time there are only a few hours of the day common to both sides, and during these hours at least 75 per cent. of the trans-Atlantic cable business is done, as is graphically shown by the print here given of the traffic chart (fig. 2). This chart was for the year 1911, and was advertised in the public Press in 1911 by the Western Union Telegraph Co.

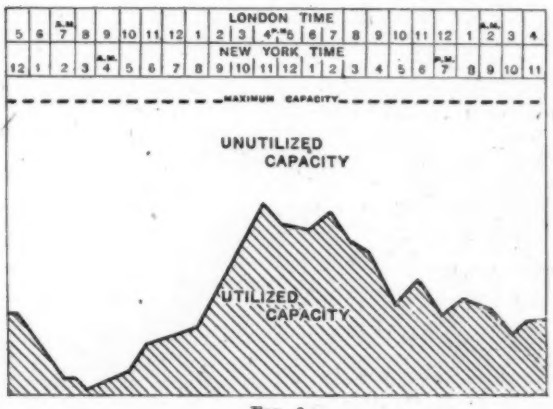

Fig. 2.

The text accompanying this chart says:—"In the interests of international business, nothing should be done to interfere in any way with the so-called *flash*, or instantaneous, service; and the lines should be kept clear to accommodate such messages during the few business hours common to both countries; but to confine the cables to this class of service would utilise only about 25 per cent. of the existing capacity of millions of property, and would place on that limited service all the capital, maintenance and operating charges. The limited time and character of the business, if best results are to be obtained, demand *direct*-cable circuits between the principal centres of the two sides of the Atlantic, as well as special circuits devoted to special business."

On this subject of the *difference of time* there would be no *business hours* common to countries separated so widely as, say, England and New Zealand; for mid-day at Greenwich is about midnight at Auckland, New Zealand.

Has it been fully considered how the difference in longitude of the various countries must affect their several interests in regard to the time most convenient for the reception and dispatch of Press news and of private message traffic? Considering that 12 hours would be devoted to Press news and testing, and the other 12 hours of the 24 to Government and private messages, the latter would be, apparently, hung up during the Press news traffic, and as the more important Government messages would, we may suppose, have the precedence, it would be a bad prospect for *private* messages—so that their senders would probably only patronise the ring route, owing to the low rate per word. Moreover, as the ring is expected to be fully occupied during the 24 hours, there would, on these occasions, be no "limited business hours" and "idle facilities" (as in the trans-Atlantic cable business) to take advantage of in order to get delayed private messages through. Consequently, it is not clear to the writer how, under the elaborate time-table of working, the several countries of the League "can be in touch with all the others at all times," or how "all their messages shall be rapidly transmitted and immediately answered."

The 3½ hours during which England is intended to send Press news round the ring to Canada and the 2 hours for private messages are really the only times during the 24 hours when these two countries can speak with each other through the *direct* circuit connecting them; and even then only supposing that their 3½ hours happen to occur in *business hours* could these stations participate in the *flash* or instantaneous messages which form so important a part of the trans-Atlantic cable traffic; therefore, they don't appear likely to get much benefit out of it.

In expecting them to keep so many exceedingly sensitive and complicated instruments in perfect order, as, in his imagination, he sees working continuously at 50 w.p.m., Mr. Preece pays a well-deserved tribute to the general expertness, ability, and patience of cable operators, but they cannot quite accomplish the impossible.

As for the frequent switchings over to conform to the routine programme, readjustments of apparatus to meet any altered electrical conditions of duplex balance, and the close attention to the times laid down in an elaborate table, it does not require much imagination to realise that the lot of the supervisor on duty, who is responsible for satisfactory working at his station, would not be a very happy one, knowing as he does that in such a chain of interdependent cable sections the failure of one relaying station affects the proper working of all others in that circuit.

With regard to *repetitions* required during Press messages by so many intermediate and simultaneously receiving stations in the ring, this circumstance alone seems likely to lead to endless confusion.

TRADE STATISTICS OF AUSTRALIA.

The following figures, showing the imports of electrical and allied goods into Australia during the twelve months ending June 30th, 1917, are taken from the recently-issued official trade statistics. The figures for 1915-16 have been given for purposes of comparison, and notes of increases or decreases have been added.

	1915-16.	1916-17.	Inc. or dec.
Gas and oil engines.—	£	£	£
From United Kingdom ...	84,000	46,000	– 38,000
,, United States ...	57,000	54,000	– 3,000
,, Sweden	4,000	6,000	+ 2,000
,, Other countries ...	10,000	5,000	– 5,000
Total	155,000	111,000	– 44,000
Portable and traction engines.—			
From United Kingdom ...	29,000	13,000	– 16,000
,, United States ...	28,000	32,000	+ 4,000
Total	57,000	45,000	– 12,000
Dynamo-electric machines up to 200 h.p., static transformers, coils, &c.—			
From United Kingdom ...	212,000	157,000	– 55,000
,, Italy	6,000	7,000	+ 1,000
,, Sweden	5,000	6,000	+ 1,000
,, United States ...	230,000	236,000	+ 6,000
,, Other countries ...	5,000	2,000	– 3,000
Total	458,000	408,000	– 50,000
Dynamo-electric machines over 200 h.p. and parts.—			
From United Kingdom ...	13,000	13,000	—
,, United States ...	—	4,000	+ 4,000
Total	13,000	17,000	+ 4,000
Regulating, starting, and controlling apparatus.—			
From United Kingdom ...	45,000	46,000	+ 1,000
,, United States ...	41,000	60,000	+ 19,000
,, Other countries ...	1,000	1,000	—
Total	87,000	107,000	+ 20,000

	1915-16. £	1916-17. £	Inc. or dec. £
Electroliers, gasoliers, &c.—			
From United Kingdom ...	19,000	12,000	– 7,000
,, United States ...	9,000	6,000	– 3,000
Total	28,000	18,000	– 10,000
Electric fittings, switches, fuses and lightning arresters.—			
From United Kingdom ...	45,000	51,000	+ 6,000
,, Japan	1,000	5,000	+ 4,000
,, United States ...	24,000	33,000	+ 9,000
,, Other countries ...	3,000	—	– 3,000
Total	73,000	89,000	+ 16,000
Lamps and lampware.—			
From United Kingdom ...	51,000	45,000	– 6,000
,, Japan	8,000	14,000	+ 6,000
,, United States ...	62,000	54,000	– 8,000
,, Other countries ...	17,000	11,000	– 6,000
Total	138,000	124,000	– 14,000
Telephone switchboards and appliances.—			
From United Kingdom ...	42,000	33,000	– 9,000
,, Belgium	3,000	—	– 3,000
,, Sweden	9,000	4,000	– 5,000
,, United States ...	73,000	17,000	– 56,000
Total	127,000	54,000	– 73,000
Wire (copper).—			
From United Kingdom ...	130,000	66,000	– 64,000
,, Japan	1,000	1,000	—
,, United States ...	27,000	5,000	– 22,000
Total	158,000	72,000	– 86,000
Electric heating and cooking appliances.—			
From United Kingdom ...	4,000	8,000	+ 4,000
,, United States ...	6,000	5,000	– 1,000
Total	10,000	13,000	+ 3,000
Cable and wire (covered).—			
From United Kingdom ...	522,000	356,000	– 166,000
,, Japan	4,000	7,000	+ 3,000
,, Italy	1,000	1,000	—
,, United States ...	20,000	19,000	– 1,000
,, Other countries ...	1,000	1,000	—
Total	548,000	384,000	– 164,000
Arc lamp carbons.—			
From United Kingdom ...	3,000	2,000	– 1,000
,, Spain	7,000	4,000	– 3,000
,, Switzerland ...	2,000	3,000	+ 1,000
,, United States ...	6,000	4,000	– 2,000
,, Other countries ...	—	1,000	+ 1,000
Total	18,000	14,000	– 4,000
Accumulators or storage batteries.—			
From United Kingdom ...	42,000	66,000	+ 24,000
,, Sweden	4,000	3,000	– 1,000
,, United States ...	22,000	22,000	—
,, Other countries ...	1,000	—	– 1,000
Total	69,000	91,000	+ 22,000
Arc lamps, vacuum tubes, instruments and insulating tape.—			
From United Kingdom ...	52,000	43,000	– 9,000
,, Switzerland ...	4,000	12,000	+ 8,000
,, United States ...	16,000	30,000	+ 14,000
,, Other countries ...	2,000	1,000	– 1,000
Total	74,000	86,000	+ 12,000
Electrical appliances not included elsewhere.—			
From United Kingdom ...	146,000	126,000	– 20,000
,, Denmark	11,000	6,000	– 5,000
,, Japan	8,000	32,000	+ 24,000
,, Holland	35,000	39,000	+ 4,000
,, United States ...	74,000	104,000	+ 30,000
,, Other countries ...	4,000	4,000	—
Total	278,000	311,000	+ 33,000
Earth and rock cutting, excavating, &c., machines.—			
From United Kingdom ...	24,000	14,000	– 10,000
,, United States ...	16,000	11,000	– 5,000
,, Other countries ...	1,000	—	– 1,000
Total	41,000	25,000	– 16,000
Rotary and percussive rock drills.—			
From United Kingdom ...	7,000	3,000	– 4,000
,, United States ...	30,000	39,000	+ 9,000
,, Other countries ...	—	1,000	+ 1,000
Total	37,000	43,000	+ 6,000

	1915-16. £	1916-17. £	Inc. or dec. £
Coal-cutting machines.—			
From United States ...	6,000	7,000	+ 1,000
Machine tools.—			
From United Kingdom ...	64,000	86,000	+ 22,000
,, United States ...	76,000	87,000	+ 11,000
,, Other countries ...	3,000	2,000	– 1,000
Total	143,000	175,000	+ 32,000
Steam turbines, economisers, superheaters, &c.—			
From United Kingdom ...	95,000	65,000	– 30,000
,, United States ...	5,000	3,000	– 2,000
,, Other countries ...	1,000	—	– 1,000
Total	101,000	68,000	– 33,000
High-speed reciprocating steam engines.—			
From United Kingdom ...	10,000	9,000	– 1,000
,, United States ...	1,000	—	– 1,000
Total	11,000	9,000	– 2,000
Motive power machinery, N.E.I.—			
From United Kingdom ...	111,000	95,000	– 16,000
,, Sweden	2,000	3,000	+ 1,000
,, United States ...	60,000	66,000	+ 6,000
,, Other countries ...	—	6,000	+ 6,000
Total	173,000	170,000	– 3,000
Wire, iron, and steel.—			
From United Kingdom ...	52,000	44,000	– 8,000
,, Canada	45,000	48,000	+ 3,000
,, United States ...	408,000	228,000	– 180,000
,, Other countries ...	4,000	3,000	– 1,000
Total	509,000	323,000	– 186,000

PROFESSIONAL OFFICERS IN AUSTRALIA.

In the Commonwealth Court of Conciliation and Arbitration the President (Mr. Justice Higgins) recently delivered judgment in a case of considerable interest to professional men, not only in the Commonwealth of Australia, but generally. The plaint was lodged by the Association of Professional Officers of the Public Service and was defended by the Public Service Commissioner and the Postmaster-General. We take the following particulars from the *Post Office Electrical Engineers' Journal*.

In delivering judgment the President stated that the number of officers in the professional division of the Commonwealth Public Service was 343, of whom 286 were members of the claimant organisation. Of these totals 223 and 210 respectively were in the engineering branch of the Post Office. The professional division was divided into six classes, A to F. Youths in training constituted the F class; the main body of the officers were in the E class, only 29 per cent. being in classes A to D.

The officers in the professional division, as distinguished from the administrative, clerical, and general divisions of the public service, embraced those whose duties required special skill or technical knowledge usually acquired only in some profession or occupation different from the ordinary routine of the public service. They had to submit to defined courses of study, and to acquire considerable scientific as well as technical training.

In the electrical engineering branch especially, his Honour stated that he had been surprised to find how far the officer must advance in mathematics, physics, electricity, &c., if he was to be properly qualified for his work; but it could not be said of these men that they attained full responsible and professional status, as they nearly all acted under some direction or supervision, and acquired their experience under shelter, not in open competition. The work was constant, and there was no risk of practice and income falling off. Full professional remuneration was, therefore, not warranted.

The professor of natural philosophy in the University of Melbourne was asked to investigate and report as to "the necessary educational, scientific, and other attainments, qualifications, and responsibilities of the officers concerned, and how, comparing the functions in the several departments, to place the said persons in approximately equivalent positions."

Speaking generally, the E class consisted of men who had passed through the ordeal of training, and reached a position analogous to journeymen in a trade as distinguished from apprentices. Classes D, C, and B consisted of men who had attained more or less leadership and control of their fellow-professionals; and class A consisted of the professional heads.

His Honour said the problem was to prescribe salaries sufficient to keep up a perpetual succession of men duly qualified for service involving this exceptional education. Treating class E as the staple class, he said that he found

dissatisfaction that severe application to science and technique did not produce an adequate reward. There had been a lack of applicants for the engineering branch. The Commissioner admitted that in the Postmaster-General's department the supply of junior assistant engineers and assistant engineers had never equalled demands, and that it had been necessary on a few occasions to go abroad for additions to the branch. He was not surprised. The Commissioner, as to the professional division, had practically adopted the same classes and salaries as for the clerical division, but added a new class at the head, although the education and training for the ordinary routine for the public service must be much lower than for professional officers. He could not regard this treatment of professional officers as being either fair or wise.

Clerical labour—the labour of the average clerk as distinguished from that of clerical officers having administrative control of others—was practically unskilled as compared with the average professional of class E. There was a tendency to make the rewards of skilled and unskilled labour too nearly equal. A perpetual flow of highly-trained men for the King's service, which involved laborious training, could not be hoped for without reasonable reward for that training.

Of the Post Office electrical engineers, responsible for the construction and maintenance of telegraphs and telephones, 223 controlled property of the public valued in 1917 at £10,000,000; the new constructions in the year before the war amounted to £1,180,000; and the annual cost of maintenance was £333,000. The number of telephone instruments had increased from 8,834 in 1901 to 52,180 in 1917. The class E engineers made inspections, prepared plans, engineering proposals, and estimates for the construction of aerial and underground lines or telephone equipment; issued detailed instructions to mechanics carrying out maintenance and other works; inspected works in progress and upon completion; certified to the conditon of the completed work; generally assisted the engineer in charge (class D) in all matters; dealt with the estimates of line inspectors and others, and with progress reports from the line foremen.

The class E engineer had to undergo a training which was equivalent to nearly three years of the four years' course in mechanical or electrical engineering in the university. The D engineer must have acquired still higher qualifications, and engineers of classes C, B, and A differed from those of the lower classes principally in the degree of responsibility and experience.

There was another consideration. The standard of qualifications required for men in the professional division was not nearly so high in 1903, when the existing scales of pay were fixed, as the standard of to-day. In the engineering branch of the Post Office, for instance, the systems of telegraphy and telephony had been revolutionised. Not only had there been an increase in the magnitude of the service, the telephone lines had been improved by the introduction of complete metallic circuits and the use of underground cables, and the telephone exchanges had been improved by the use of the common battery and automatic exchange systems. In telegraphy, the development had been in the increased speed of the transmission of messages, and in the increase of the number of messages simultaneously and automatically sent over a single telegraph line. On these grounds, therefore, he proposed to increase the minimum of the E class from £216 to £300.

The superior classes would be raised in what he regarded as due proportions. The minimum for the F class was £84, and he fixed it at £96.

Regarding increments to salaries, it was an attractive idea to leave the grant of increments to professional officers purely to the discretion of the Commissioner; but it did not work. The Commissioner and his inspector did not know how the officer carried out his daily duties, did not even understand what his duties involved. The superior officers of the professional branch did know. His Honour proposed to make the increments annual and automatic, unless the professional head of the department reported adversely in writing as to the conduct, diligence, or efficiency of the officer.

Re acting appointments, it seemed to have been a common practice to get men to perform the functions of a higher class than their own, to call them acting in the higher positions, and yet to pay them no higher remuneration, unless the period was for six months. The Commissioner suggested three months, but his Honour saw no sufficient reason for departing from his rule of one month, which he had previously laid down in relation to mechanics and linemen.

The ordinary hours of duty would be from 9 a.m. to 4.30 p.m. Monday to Friday, and on Saturday from 9 a.m. to noon; but any officer might be required to work overtime without payment for any hours after 8 a.m. and before 6 p.m. provided that 81 hours per fortnight were not exceeded.

The minimum rates of wages to be paid to employés who were members of the claimant association would be as follows:—Class F, £96 per annum; class E, £300; class D, £408; class C, £516; class B, £606; class A2, £700.

Officers in classes C, D, E, and F would be entitled to increments as follows:—£18 per annum until the salary reached £588 in class C, £498 in class D, £390 in class E, and £294 in class F.

Officers in class B might be awarded three increments of £24 each, and officers in Class A2 two increments of £100 each, at the discretion of the permanent head.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

16,696. "Electric fuse holders." Siemens Bros. Dynamo Works & J. C. Willcocks. October 14th.

16,702. "Flexible joint for cables, &c." J. Baker. October 14th.

16,704. "Incandescent electric lampholders." G. F. Colson. October 14th.

16,735. "Wireless telegraph valves." Edison Swan Electric Co. & E. E. Hiatt. October 14th.

16,736. "Lifting magnets." F. N. Pickett and A. West & Co. October 14th.

16,737. "Alternating-current motor starters." R. P. Bosson, V. Breeze and A. West & Co. October 14th.

16,739. "Manufacturing alloys of metals, and electrodes therefor." J. J. Shedlock. October 14th.

16,762. "Electrodes." H. Gerrard & E. Newbery. October 14th.

16,778. "Electric lamp lock." O. J. Reilly. October 15th.

16,784. "Electric welding apparatus." R. F. Woodburn. October 15th.

16,806. "Electric welding machines." British Thomson-Houston Co. (General Electric Co., U.S.A.) October 15th.

16,807. "Sparking plugs for ignition purposes." A. E. Heath. October 15th.

16,819. "Electric controllers." R. W. James & R. W. Stanley. October 15th.

16,850. "Apparatus for electro-magnetically controlling jigging-conveyors." C. Candlot. October 15th. (France, May 24th.)

16,911. "Electric starting motors for internal-combustion engines." C. L. Breeden, H. Lucas & H. N. Urquhart. October 16th.

16,918. "Systems of electric motor control." British Thomson-Houston Co. (General Electric Co., U.S.A.) October 16th.

16,972. "Vibrating contacts." A. B. Wood. October 17th.

16,974. "Protective devices for alternating electric current distribution systems." British Thomson-Houston Co. (General Electric Co., U.S.A.) and E. B. Wedmore. October 17th.

16,979. "Electric ignition." H. G. Solomon. October 17th.

16,982. "Spark plugs for internal-combustion engines." B. Hopps, A. M. Lodge & Lodge Sparking Plug Co. October 17th.

16,995. "Electric ignition apparatus for internal-combustion engines." G. E. Turnbull. October 17th.

16,996. "Alternating-current dynamo-electric machines." British Westinghouse Electric & Manufacturing Co. and G. H. Fletcher. October 17th.

16,999. "Thermionic amplifiers." Igranic Electric Co. (Cutler-Hammer Manufacturing Co., U.S.A.) October 17th.

17,000. "Electrical discharge devices." Igranic Electric Co. (Cutler-Hammer Manufacturing Co., U.S.A.) October 17th.

17,002. "Electric lamps." G. Oldham & J. Oldham. October 17th.

17,024. "Sparking plug." H. S. Cooke. October 18th.

17,038. "Portable electric lamp." A. R. Upward. October 18th.

17,053. "Electric welding machines." British Thomson-Houston Co. (General Electric Co., U.S.A.) October 18th.

17,054. "Radio telegraphy and telephony." M. Latour. October 18th. (France, October 18th, 1917.)

17,084. "Electric safety signal for motor vehicles." S. Springer & F. van den Wyngaert. October 19th.

17,120. "Automatic alarm device for vacuum tube relays." M. Latour. October 19th. (France, October 4th, 1917.)

17,122. "Stopper for containers of electric accumulators." Soc. de l'Accumulateur Tudor & Tudor Accumulator Co. October 19th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1917.

10,772. Combined ignition and lighting and like current generators. L. J. le Pontois. July 6th, 1917. (119,254.)

13,627. Security or locking devices for electric incandescent lamps. Benjamin Electric, Ltd., & E. Fowler. September 21st, 1917. (119,270.)

13,885. Metal electrodes used in deposition and soldering by the electric arc. E. H. Jones. September 26th, 1917. (Additions to 14,468 of 1915.) (119,279.)

14,054. Watertight glands for electric cables. L. Newitt and Callender's Cable & Construction Co. September 28th, 1917. (119,293.)

14,838. Method of construction of electric furnaces of the heated-coil type. J. E. P. Kievits & Kynochs, Ltd. October 13th, 1917. (119,302.)

16,012. Electric cables. P. H. Chase. November 2nd, 1917. (111,110.)

17,525. Electric telephony. P. S. Gomez. November 27th, 1917. (119,341.)

18,168. Protective means for systems of electric distribution. British Thomson-Houston Co. (General Electric Co., U.S.A.) December 7th, 1917. (119,345.)

18,789. Electrical cut-outs. British Thomson-Houston Co. (General Electric Co., U.S.A.) December 18th, 1917. (119,354.)

1918.

36. System for amplification of small currents. British Thomson-Houston Co. (General Electric Co., U.S.A.) January 2nd, 1918. (119,365.)

404. Means for attaching mouthpieces of telephones, speaking tubes, and the like. Taylor, Tunnicliff & Co. and E. D. M. Scrivener. January 8th, 1918. (119,370.)

1,790. Insulators for supporting electric conductors. H. R. Lamb. January 31st, 1918. (119,382.)

1,805. Sparking plugs for ignition purposes. A. E. Heath. January 31st, 1918. (119,383.)

1,918. Self-starters for internal-combustion engines. Electric & Ordnance Accessories Co. & F. Wood. February 2nd, 1918. (119,384.)

2,769. Measurements or indication of alternating electric current quantities and apparatus therefor. E. Fawssett. February 16th, 1918. (119,388.)

5,109. Electric motor controllers. Igranic Electric Co. (Cutler-Hammer Manufacturing Co., U.S.A.) March 22nd, 1918. (119,405.)

5,181. Sparking plugs. Soc. Generale des Huiles et Fournitures Industrielles l'Oleo. October 15th, 1917. (119,407.)

7,702. Sparking plugs for internal-combustion engines. H. V. J. Joufret. January 14th, 1918. (119,419.)

10,730. Caps or holders for electrical fuses. E. G. Nicholls. June 29th, 1918. (119,431.)

11,577. Magnetic tray control for use in connection with biscuit-making machinery. A. Mason & A. E. Bowers. July 15th, 1918. (119,435.)